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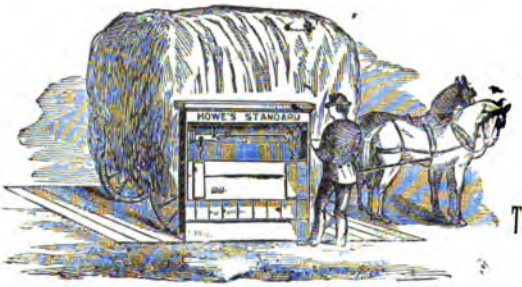

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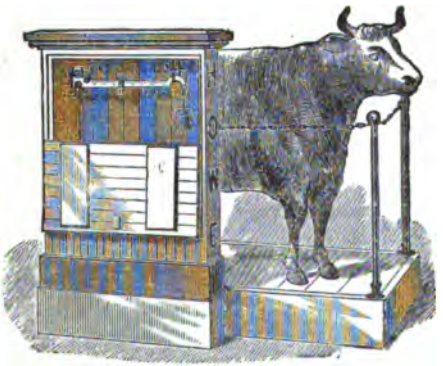

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THE JOURNAL

OF

THE AMERICAN AGRICULTURAL ASSOCIATION.

VOL. 1. No. 1.

Jos. B. Reall,

SECRETARY AND EDITOR.

NEW YORK:

PUBLISHED BY THE ASSOCIATION,

1881.

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THE JOURNAL

OF THE

AMERICAN AGRICULTURAL ASSOCIATION.

The American Agricultural Association was started with the belief that a national organization is just as necessary for agriculture as the Federal Government is for the States. The fact that agriculture is the main dependence of the country was recognized, and that great as its development has been and flourishing as its condition is, its resources must be husbanded and greater pains taken for its conservation. It was believed that new methods should be employed, new practices followed, and greater safeguards thrown around the industry. It was felt that larger crops should be grown from the same acreage in order to supply the increasing demands upon us for home and foreign consumption, and as agriculture never has received any proper thought or attention by the General Government, but, on the contrary, legislation has been frequently against the interests of the farmer, it was considered desirable to have a strong national organization of farmers for the protection of their rights and to procure needed legislation. They will not remain in a position that requires them to wait year after year, as in the pleuro-pneumonia matter, for congressional action.

That there is room for such an organization admits of no question, for in England the strongest institution is the Royal Agricultural Society, supported by the best men in the land, and having a membership of 8,000. France also has a national agricultural society. In neither country is one needed so much as in America.

It is asked, How can the organization be of use? Organization is always beneficial. A society comprising within its membership representatives of the agricultural industry of every section of the country will constitute a power for good not equalled by any other body. No other institution can wield so large and useful an influence for individual and public good. Immigration matters may receive proper attention from it. Through a

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Journal and by conventions the best agricultural thought and experience will be collated and disseminated. Through exhibitions stimulus will be given to the production of the best. To do all this, time is necessary. The organization cannot be built up in a day. No really useful institution ever was. As was said at the convention of 1879, the man who does most to popularize farming will have gone a long way towards solving a question that has agitated the minds of philanthropists of all ages—the lessening of human woe. Make farming as popular with the masses as it has been with the thinking men of all ages, and still is, and there will be less poverty, less crime, and less suffering.

The *New York Herald* said of the organization when starting:

"An effort is to be made to organize a National Agricultural Society. *There is no country in the world where such an association could be so easily and cheaply managed, or do so much good.*"

The breadth and aim of the organization are as great as the land for which it is named. It will foster every interest of the soil in every section of the land. Protesting against discrimination adverse to the interests of agriculturists, it will seek to encourage every honest industry and to promote the best good of all. It invites not alone the tiller of the soil into its councils, but all who seek the general good are welcome. Natural results are sought to be obtained by practical means. So far as practicable it will perform the work formulated by the Royal Agricultural Society.

"1. The general dissemination of knowledge relative to the best methods of agriculture.

"2. Systematic testing of competing agricultural implements.

"3. Scientific investigations into diseases of animals used on the farm.

"4. The technical education of veterinary surgeons, tenants and landowners.

"5. Exposure of frauds in the sale of inferior or adulterated manures, feeding stuffs and seeds.

"6. Embodiment of such information contained in agricultural publications as may be proved by practical experience to be useful.

"7. To encourage men of science in their attention to the improvement of agricultural implements, the construction of farm buildings and cottages, the application of chemistry to the general purposes of agriculture, the

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destruction of insects injurious to vegetable life, and the eradication of weeds."

While refraining from reproach and harsh criticism, justice to all demands the statement that the present management is in no way responsible for the inactivity of the Association during the year 1880. The failure to follow the auspicious opening by meeting the hopes and expectations of those who early joined the organization resulted in such disappointment and distrust as to make the work of re-establishment doubly difficult. If the friends of the enterprise could fully appreciate this difficulty, they would be very charitable. They may now rest assured that, however long it may take, and however much it may cost in time and money and thought, the American Agricultural Association shall yet be the largest and most useful agricultural organization ever known.

To three gentlemen especial credit is due in connection with the organization of the American Agricultural Association. Lawson Valentine, Esq., of New York became interested in the enterprise at the start, and for many months furnished office room and clerical assistance free, besides contributing several hundred dollars in cash towards the expenses of organization. By his advice and counsel, and by his earnest practical work, he rendered invaluable assistance. It could never have lived but for him. Major Henry E. Alvord of Massachusetts, from the beginning of the enterprise, has been one of its principal supporters. As counsellor and worker, he has rendered assistance of the most important character, and to his suggestions and labor every credit is due. He has served it in a degree that cannot be surpassed, because of his untiring devotion to the cause, and his ability to do the best. Hon. N. T. Sprague of Vermont remained its friend through its darkest hours, and when it was necessary to infuse new life came forward voluntarily with his purse and suggestions. The work done by these three gentlemen has been of the greatest possible service to the organization, and its value cannot be over-estimated. Whatever the position of the Association may be to-day, it has cost an amount of thought and labor that cannot be estimated. It was believed to be needed, and that it could be made useful to the country, and no thought or expense has been spared by its promoters for its firm establishment. The newspaper press has been most generous in its support. Officers of the State Agricultural Societies and of the Grange have been among its best friends. In all parts of the country, men in all

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walks of life have lent a helping hand, and to all the warmest thanks are due.

The articles which form the greater portion of this volume were, in part, presented at the convention of 1879, as stated in the record of proceedings, and the others have been prepared especially for it. To the eminent gentlemen who have thus contributed, the thanks of the Association are sincerely tendered. And we congratulate our readers upon the excellence of these papers, and their lasting value to the interests represented by this Association.

The Press is invited to republish any article in this Journal, giving proper credit. The Association desires to give each as wide a circulation as possible; its aim is not to interfere with any publication, but, on the contrary, to co-operate with all in collecting and disseminating useful information.

J. H. R.

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PROCEEDINGS.

The Convention which met at the Metropolitan Hotel, New York, December 10th, 1879, to organize a National Agricultural Society, was the outgrowth of a meeting of gentlemen from different sections of the country interested in Agriculture, held at the Farmers' Club rooms of the American Institute, New York, on October 22d, 1880. At that meeting Victor E. Piollette of Pennsylvania was Chairman, and Ezra Whitman of Maryland, and D. W. Wilson of New Jersey, were Secretaries. The following resolution was adopted and the committee appointed:

Resolved, That a committee of thirteen be appointed by the Chair to issue a call and make preparations for a meeting in New York City on Wednesday, December 10th, at such hour and place as may be deemed expedient, for the organization of a National Agricultural Society, and that said committee make arrangements for the reading of papers and discussion of questions relating to agriculture at such meeting, as well as prepare a Constitution and By-laws for consideration of the meeting, and a form of charter that Congress will be requested to grant.

The Convention of December 10–13 was attended by leading agriculturists, journalists, scientists, and men of note from nearly every State and Territory in the Union, and was probably the most earnest and noteworthy gathering in connection with agricultural matters, as it was certainly the largest of its kind, that has taken place in this country for many years. N. M. Curtis of New York was elected temporary President, and M. J. Lawrence, A. R. Ledoux and E. A. Carman, Secretaries. A list of the permanent officers elected appears in another place.

Dr. A. S. Heath, President of the Farmers' Club of the American Institute, read a paper upon "The best methods of increasing the value of our neat cattle," in which he compared the respective merits of the different breeds as adapted to the production of milk, butter, cheese and beef,—concisely reviewed the fundamental principles of breeding and the results of their adoption, and advocated the selection of breeding animals upon their individual and family records in the line of improvement sought, rather than by long pedigrees (without performance) and "fancy points" arbitrarily determined. He urged greater care of cattle, both young and old, and drew a very striking picture of the difference between the care and keeping bestowed upon a favorite horse and that given to a cow equally valuable and far more productive.

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Mr. A. W. Dickenson of New York made a short address on Agricultural Journalism, in which he described the advance made in the past sixty years, the better support given by farmers to good periodicals devoted to their interests, and the improvement in the "agricultural departments" of leading newspapers, where capable specialists have been called to the place formerly held by the office paragrapher and his scissors. He claimed that agricultural publishers deserved a still more generous support from the farmers of America, and that they were ready and able to supply any demand made upon them, both as to the quality and quantity of matter put to press.

Jos. Hall Platt, M. D., New York City, read a paper entitled "The Importance of Veterinary Science," in which he said:

There are very few points of practical science in which the acquirements of our American people are not equal or superior to those of any of the older nations of the world. But there is one of great importance to all sections of our country, not only and chiefly its agricultural districts, but also to its commercial and manufacturing centres. That is the subject of Veterinary Science.

Most of the countries of Europe have regularly incorporated colleges, under the patronage and protection of the Government, and devoted entirely to the teaching of scientific veterinary knowledge, and the results are eminently satisfactory to the owners of all classes of domestic animals, as well as very lucrative to the graduates of these institutions. On the other hand the great American nation, amidst many and valuable institutions of learning, has only three Veterinary Colleges. New York City boasts of two of these—the American Veterinary College, and the Columbia Veterinary College. Cornell University also has a department of Veterinary Science. We know, personally, that the course at Columbia College is thoroughly scientific and that its standard of requirements for graduation is very high.

The graduates of these institutions are centred in and around our great cities and find extensive and lucrative employment, while the agricultural districts of the country are unsupplied or left at the mercy of the horse doctor, whose acquirements in nine cases out of ten render him far less fit to treat disease among animals than the intelligent farmer, aided by a reliable Text book of Veterinary Treatment.

For some unaccountable, short-sighted reason, this branch of science has been wonderfully neglected among us. Few men seem to realize its great importance. There are many more millions of bovines than human beings in our country, besides the sheep and horses and swine, to say nothing of the many useful and valuable dogs, poultry, and even cats and birds, and the veterinary requirements of our menageries is not an insignificant item. All of these come within the range of an educated D. V. S.

When cattle meet with an accident that could be cured by skillful treatment, they are usually sent to the butcher, often losing to the owner several years of valuable service, and their price for beef not beginning to replace them. When attacked by disease they are killed or left to die for want of a D. V. S. Many millions of dollars are thus sacrificed in this country every year which could be saved by a sufficient number of skilled veterinarians.

What farmer would not rather pay $10 for medical services for his useful animals than lose a much larger sum in replacing them when disabled?

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The results of the work done by the Commission appointed by the Governor of New York, in the suppression of *pleuro-pneumonia contagiosa*, is a standing monument to the value and efficiency of veterinary science.

This Commission has succeeded in stopping the spread of this disease, and confining the diseased and exposed cattle in such manner as to stop its ravages in all the districts they have been able so far to reach. One remarkable fact, and one that speaks very highly for veterinary skill, is that of the many hundreds of cattle killed for this disease, the Commissioners have never once been wrong in their diagnosis. In the beginning of their labors they met the fiercest opposition, not only from the so-called horse-doctors, but even the newspapers joined in the hue and cry against them; but confident of their knowledge, they kept steadily on, and the results have not only proved their skill, but crowned their deeds with well-merited applause.

The General Government could very materially aid this matter by calling for a supply of competent veterinarians for its army and other purposes. The regiments of all the European armies are supplied with veterinary surgeons. In the United States Army no such wise provision is made. Schools of veterinary science might be attached to its military schools. But just here comes in a question. Medical schools, as departments of our colleges and universities, have not proved successes; would departments of veterinary science succeed any better? Independent schools often possess a vigor and tone that they do not acquire as part of an establishment. These subjects require much careful attention, for America, in this, as in other matters, will lay out a new road for itself, and in a short period of time will outreach all her competitors in the Old World. The American Agricultural Association can exert great power in influencing this work, and can aid further in many ways the cause of veterinary science if only by disseminating a knowledge of the importance of it and the great defficiency of supply for the demand everywhere apparent.

Hon. Charles L. Flint of Massachusetts called attention to the cattle disease known as pleuro-pneumonia, and made an earnest appeal for action towards its extinction. Major Wm. Gentry of Missouri, Hon. J. B. Grinnell of Iowa, R. J. Dodge, Esq., of New York, Dr. A. S. Heath of New York, Col. J. B. Mead of Vermont, Prof. W. H. Brewer of Connecticut, and others, advocated the same measure. On motion it was resolved that the Board of Directors prepare a memorial to Congress, asking for the appointment of a commission, and the appropriation of funds for the suppression of the disease.

Lectures were delivered by Dr. Geo. B. Loring of Massachusetts, Dr. Albert R. Ledoux of North Carolina, Prof. C. V. Riley of Washington, Dr. Manly Miles of New York, Prof. W. H. Brewer of Yale College, and Hon. X. A. Willard of New York; all of which appear in full elsewhere in this Journal.

Letters were presented from a large number of gentlemen, extracts from some of which are printed in this volume. The proceedings occupied three days. The Constitution adopted, and amended a year later, together with other matters, appear in appropriate places.

J. H. Reall resigned the secretaryship January 28, 1880, six weeks after the organization, and was succeeded by Major Ben. Perley Poore.

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On Thursday evening, December 30th, 1880, a meeting of members was held at the St. Nicholas Hotel, New York. Mr. H. M. McLaren was called to the chair, and Messrs. A. H. Butler and B. H. Malone were appointed Secretaries. Owing to the inactivity of the Association during the year, the only business of interest was the election of officers for the ensuing year, and the adoption of the following resolutions presented by J. H. Reall:

Resolved, That, as the Association failed to publish the Journal this year, and to meet the expectations of those who joined it, all present members be excused from the payment of dues for the year 1881, and that the Journal, and all publications, be furnished each, free of charge.

Resolved, That prompt measures should be adopted by the National Government for the extinction of the cattle disease known as Pleuro-Pneumonia, and that a commission on the subject should be appointed by Congress.

Resolved, That the World's Fair, to be held in this city in 1883, is entitled to every encouragement, and that this organization co-operate with the management, in every way possible, and that a Committee be appointed to convey the sentiment of the Association to the Commission.

A. H. Butler of New York, G. W. Simpson of Massachusetts, D. W. Seiler of Pennsylvania, Col. R. P. McGlincey of Illinois, and J. Alex. Fulton of Delaware, were appointed a Committee to take charge of the resolution with reference to the World's Fair.

The Board of Directors and Officers for 1881 met for organization at the St. Denis Hotel, New York, February 3d, President N. T. Sprague of Vermont in the chair; J. H. Reall of New York, Secretary.

Among those present were: Hon. Thomas T. Kinney, President of the New Jersey State Agricultural Society; ex-Gov. Hyde of Connecticut, Dr. Alfred L. Kennedy of Pennsylvania; Dr. Peter Collier, Chemist of the Department of Agriculture, Washington, D. C.; Prof. W. O. Atwater of Connecticut; B. M. Hutchings of Michigan; B. H. Malone; A. H. Butler of New York; Francis D. Moulton, President of the International Dairy Fair Association; Hon. Thomas A. Galt of Illinois; Gen. N. M. Curtis of New York.

A large number of letters were submitted from leading men in all sections of the country expressing their regrets at being unable to be present at the meeting, but evincing earnest sympathy with the Association and a desire to co-operate in its advancement.

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On assuming the duties of President, Col. Sprague made the following address:

GENTLEMEN OF THE AMERICAN AGRICULTURAL ASSOCIATION:

On the 10th day of December, 1879, two hundred and fifty gentlemen, representing twenty-three States and one Territory, met (pursuant to a call signed by a Committee appointed at a previous meeting,) at the Metropolitan Hotel in this city, to consider the necessity of an organization of the producers of this country. The farmer, the lawyer and the law-maker, aided by the scientific men present, after mature deliberation and without a dissenting voice, proceeded to the work before them. A temporary organization was effected, a nominating committee selected, a board of officers elected, and the convention listened for two days to speeches and papers from the most eminent and scientific men of this land,—united in the promotion of our agricultural interests, the source of our country's wealth and prosperity. Hoping to perfect an organization whose object would be to work in each and every direction tending to the promotion of the laborer, and the increased sale of his products, committees were appointed, and work laid out, that promised success. The work so auspiciously begun, seemed certain of success. Efforts were made by your Directors to procure a charter from Congress; your Committee appointed for that purpose, appeared before the Agricultural Committee of the Senate and House to urge immediate action upon their request. Such was the pressure of public business that nothing was done by either Senate or House Committee before the session closed.

From this time the work seemed to drag, and our President, failing to call the annual meeting, as specified in Article 3 of our Constitution, a meeting was called by some of our live, active members, for December 30th, 1880, to meet at St. Nicholas Hotel in this city, to elect officers for the ensuing year, and to transact any other business thought proper. The work so well begun a little more than a year ago was taken up, not to be laid down or allowed to rest until our official lives terminate; and when that hour arrives, we ask as our only reward, to hear our successors say, well done good and faithful servants, the legacy that you have left us is one above price; we will transmit it to our successors in the same spirit and with the same hope of its future. On the 11th day of January, 1881, this Association was incorporated under an Act of the Legislature of the State of New York, passed May 12th, 1875. Much labor and thought has been given to this Association by its promoters. The Society is to-day out of debt, with its life membership fund intact. We trust that no efforts will be spared by members and officers to make the Association the representative organization of the greatest industry of America.

I feel deeply the honor this Association has conferred upon me by their elevating me to the highest position in their gift. I realize the responsibility resting upon the President of this Society, also the efforts that must be made by each of its officers to insure success, and to meet the demands of the agriculturist, wherever he may be located in our broad domain. The Pacific and the Atlantic coasts, the extreme South as well as the far North, must each receive at our hands the most careful attention and our best efforts for their improvement, that each and every American farmer may truly say that the American Agricultural Association is his friend and guide.

This organization rests upon the yeomanry of this land as its base, and for its support upon the intelligence of the masses which it represents, with the knowledge that every other branch of American industry is directly interested in ours for their success. We feel assured that our efforts to perfect this organization for the improvement, in fact, of all the industries of America, will meet with the most hearty commendation of all classes of our citizens.

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If this subject could be brought directly before those most interested, they would readily realize the importance of sustaining their own individual interest, which is the interests of more than fifty millions of people, not including millions in the old country that this country is feeding to-day, and must in the future feed to a much greater extent. This country must be the great producing country of the world; all nations will to a greater or less extent depend on us for their supply, not only of food, but in mechanical arts. The question is, shall we be prepared to supply the demand? To you, gentlemen, members and officers of this association, I feel that I shall not appeal in vain.

Committees should be appointed on Finance; on Printing; on Chemistry; on Botany; on Exhibition; etc., etc.

Possibly some action should be taken to show our interest in the coming World's Fair, to be held in this city in 1883, and, if possible, further the interest already manifested by many of our most prominent citizens in that direction. In conclusion, gentlemen, I feel certain that the work before us could be placed in no better hands than your own, and remember, gentlemen, where much is given, much is expected in return.

Upon motion of ex-Gov. Hyde, of Connecticut, seconded by Dr. A. L. Kennedy of Pennsylvania, the thanks of the Association were tendered President Sprague for his address, and it was ordered printed in the Journal.

By-laws for the government of the Association were adopted, and Standing Committees announced by the President.

Dr. Peter Collier, Chemist of the Department of Agriculture, Washington, made some interesting remarks concerning the value of the process of extracting sugar from corn-stalks and sorghum. He said:

"During the past year there have been examinations made of 38 varieties of sorghum, grown in, and received from, 14 different States, and from 9 varieties of Indian corn. The results from analyses made, 1,318 in all, of the sorghums, showed them to yield on an average 1,662 pounds of available sugar. From four of these varieties the sugar was extracted in quantity and at a rate of fully 2,000 pounds per acre. As to the corn-stalks, the results were most satisfactory, but the experiments were not so numerous as with sorghum. An average of 26 analyses of the 9 varieties examined showed them to contain in their juice an amount of sugar greater in quantity than the average of the best 30 specimens of 60 specimens of sugar-beets grown in different parts of the country. After a large crop of ripe corn had been gathered, the stalks yielded at the rate of over 900 pounds of sugar to the acre, and there appears no reason to doubt that this result could be obtained upon a large scale. In view of these results I feel justified in saying that there appears no reason to justify us in importing sugar which would not justify our importation of corn and wheat. In view also of the gradual but decided improvement of our Western lands, which a carefully compiled result of the acreage yield for the past 18 years establishes, it seems most wise that we turn our earnest attention to this question of sugar production. You are also aware that the ash of corn is composed of matter derived from the earth, and unfortunately consists of those two substances least abundant and most valuable, viz., phosphoric acid and potash. Indeed, so great is our corn crop—occupying 37 per cent. of our cultivated lands in the United States as it does—that at the prices we pay for these

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two substances the amount present in our corn crop aggregates the enormous sum of over $100,000,000, while the entire value of our corn crop is about $500,000,000, so that when the time comes, as come it may, that to keep up the fertility of our Western lands we must return what we take from the ground, it will require, as will be seen, a sum equal to 20 per cent. of the entire value of the crop."

Upon motion of Mr. Moulton it was

Resolved, That if the Secretary receives a communication from the World's Fair Commission, expressing desire for the aid and co-operation of this Association, the President be empowered to appoint a committee for the purpose of such co-operation as may be invited.

The following resolution was offered by Dr. Alfred L. Kennedy, of Pennsylvania, and adopted:

Resolved, That the Directors of this Association have heard with great pleasure of the project to hold an international cotton exhibition at Atlanta, Georgia, next year, and that they would urge upon the members of the Association the importance of co-operating in the project.

The following were also adopted:

Resolved, That before any State in which a State society holding exhibitions exists shall be selected as the place for holding an exhibition of this association, six months' notice of the desire of the association to make such selection shall be given to said society.

Resolved, That the various committees be requested to present reports, in writing, on the subjects respectively committed to them, at the next annual meeting, and that in arranging the programme of that meeting, an hour be assigned for the consideration of each report.

Adjourned.

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THE PROBLEM OF AMERICAN LAND-HOLDING:

A LECTURE

Delivered at the Organization of the American Agricultural Association, December, 1879.

BY

HON. GEORGE B. LORING
OF MASSACHUSETTS.

GENTLEMEN :—The organization of a National Agricultural Society at this time is a matter of deep interest to all who are directly or indirectly engaged in pursuing and developing the great occupation on which a large portion of our people depend for subsistence, and on whose judicious management rests much of the prosperity of our varied national industry. It is entitled, moreover, to thoughtful and favorable consideration on account of the opportunity it offers for mutual understanding and good-will between the various States and sections of our country. And I have consented to encourage by formal address this effort, from a desire to point out to the land-owners and land-cultivators of the United States the true character of their calling and the spirit which should animate it everywhere, as distinguished from the farming of every other people on the earth.

In doing this I shall not discuss those practical questions over which so much investigation has been conducted by agricultural inquirers and explorers for so many years—questions which have been settled and unsettled repeatedly by debaters and writers, and have been decided at last by the practical workers. It cannot be expected that I should enter upon a disquisition on the best modes of farming, the best crops to raise and how to raise them, the best cattle to keep and how to keep them. I think it is well to recognize the fact that the farmers of this country know something about their business already, and that the manner in which prosperous agriculture has been thus far conducted by themselves and their fathers indicates a degree of knowledge which is entitled to respect and consideration. I do not recognize the necessity of teaching a farmer who has been successful with his dairy and has known a good cow from a bad one, the best cattle for his farm. I have no desire to prove to the prosperous growers of vegetables in this section, that they ought to turn their attention to raising corn even in a latitude of short and doubtful seasons and that they can raise it for 30 cents a bushel regardless of the value of the land on which it is raised, the cost of manure used in raising, and the expense of the labor employed in managing the land and the crop I should be very reluctant to impress upon the practical farmers of this assembly who have learned by their own experience and that of their fathers, that herds-grass, red-top and clover are the three staple grasses for conversion into hay, the best for seeding, the best for protecting each other, the best for curing into the most nutritious and marketable hay. I should be very reluctant, I say, to impress upon them that they had better abandon these well-known and well-proved varieties, and resort to unknown and untried varieties, not one of which has yet been adopted as a foundation for the hay crop.

I should hesitate about endeavoring to prove to you that a clover-crop is a better fertilizer than barn-yard manure, on which you have been in the habit of relying. I

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have no desire to tell the farmers of this country, who have been all their lives engaged in cutting and curing hay, how to harvest this important crop, when I meet in every populous region loads of their hay bound to a neighboring market, whose fragrance charms the traveler on our highways and whose quality stands approved both by judicious purchasers and hungry animals. Why should I try to teach you the best time to sow grass seed, and to plant potatoes, and to sow your grain, and harvest your mangold and swedes, and the best way to apply your manure, when your own experience has taught you all this long ago? Questions like these I am willing to refer to an intelligent body of farmers who have generally exercised good judgment in the management of their business, and to realize that they already know that plan of farming best suited to the land they cultivate. I am aware that the farmer cannot afford to devote season after season to trying experiments suggested by some restless theorist, or by some ambitious teacher who thinks that all change is progress, and that no law can be learned by practice, and who feels that he must say something in order to earn his salary. I am also aware that a well-devised, definite, prosperous plan is of the highest importance to him who proposes to live by tilling the soil, and I have noticed that he who simplifies this plan most readily and pursues it most steadily, undiverted by promises and unconfused by theories, never captivated and misled by the idea that there is a short and easy road to successful farming, more than there is to great learning, is the one who arrives at that prosperity which we all desire. I am quite unwilling to discuss practical questions merely for the sake of discussion—knowing well that while I stand still to debate, the weeds will grow apace.

And so, referring the anxious student of agriculture to the successful corn-growers, and grass-growers, and grain-growers, and root-growers and fruit-growers, and dairy-managers, and cattle-feeders for information upon the various topics in which each one has manifested skill, and warning him that they who talk the most oftentimes produce the least, I leave you to the knowledge which the best of you have acquired by practice, and call your attention to a matter of fundamental importance to you all —a question upon the solution of which in a satisfactory manner depends the very existence of agriculture as an industry to be cherished and developed by a free, enlightened, educated, and ambitious people.

We are told that the great mass of mankind live by tilling the soil, in every civilized country on earth; but while this fact is constantly impressed upon our minds we are not so definitely informed with regard to the manner in which they live, their social condition, their civil relations, their domestic economy. The condition of those employed in manufactures and the mechanic arts varies, we are aware, as the place in which they are organized in various countries varies—prosperity, thrift, intelligence, being secured to some, poverty and ignorance being visited on others. And judging by the various conditions of associated man, in the many countries in which society is organized, we can infer that the agricultural population of our country differs from the agricultural population of another as their domestic conditions, their modes of education, their social and civil obligations and duties differ. The tenant-farmers of Great Britain, the peasantry of Russia, the farmers of Germany, the small land-holders of France, the agricultural citizens of the United States, all represent one industry—and yet how widely they differ in everything which goes to make up man's condition as an intelligent being and as a member of some form of state and society! So true and striking is this that I am sometimes inclined to think that the moral, intellectual and social condition of the agricultural population of a country is more indicative of its real civilization and of its advancement in all the arts and cultivation of life, than are its churches and schoolhouses, its systems of education and religion!

The great question now occupying the minds of those interested in the welfare of civilized man as a member of society, is—How can the comfort, prosperity and intelli-

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gence of the agricultural population be best subserved and promoted? England discusses the welfare of the tenant-farmer. Russia considers the condition of the recently-emancipated serf. France is interested in the prosperity of an unambitious, industrious, frugal body of small land-holders and cultivators. The American goes further and enquires: "How can an American farmer, occupying a farm of usual dimensions here, discharge his duty to the State as a voter and taxpayer, and gratify his desires with regard to the education of his family, the comfort and culture of his home and the informing of his own mind and the gratification of his tastes, from the income which he can derive from the cultivation of the land?" And this is the American Problem of to-day.

That the prosperity of agriculture has kept pace with the increasing prosperity of every other industry in our land is manifest. The activity of the great grain-growing sections of our country has been great for more reasons than one; and the demand for the products of the pasture and the stall has been most encouraging to those who supply the provision market at home and abroad. It may be that the encouragement of local and special crops has not been as great—and that the farmer is called upon to consider how he can secure a suitable reward for the labor which he applies to the careful and systematic tillage of the soil to supply local markets with what they require, and for the care which he bestows on the orchard and the dairy. And yet I think personal effort is well rewarded, and that the small farmer in favored localities will find even from slow and reduced markets a compensation nearly as great as he obtained when his personal expenses were greater and the wages of labor much larger than they now are. I am aware that great discouragement has fallen upon this class of farmers in whose hands rests that system of agriculture which must prevail as our country increases in population. And yet the condition of the farmer here is looked upon as so satisfactory in every point of view, that the lesson taught by us is engaging the minds of some of the most thoughtful statesmen and publicists of the old world.

It has been discovered that the American system of land-holding, for instance, is the foundation of great popular content, and accompanied as it is by great social and civil opportunities, surrounded as it is by the free institutions of our land, attended as it is by the school-house and the meeting-house, and by the constant call to public service which leaves but few exempt among us, it constitutes the foundation on which rests great mental activity, great dignity of character, great enterprise and ambition.

To the practical work of the agricultural community here, widespread disaster, moreover, is almost unknown. The local damage of a drought or a flood is not, indeed, unusual, but the extent of our territory is such, the diversities of our soil and climate are so great, that the disasters seem to be circumscribed and accidental, while the prosperity is widespread and constant. With landed possessions which are obliged to bear the burthens of heavy taxation, with the wages of labor vastly greater than in any of the countries of Europe, with the personal requirements of the farmer and his family increased by social obligations, and the natural demands of a free and responsible people, we have been able to compete in the grain markets of the world with those who in some instances are furnished with land free of rent and taxation, and whose necessities are so small and whose duties are so low, that the former seem intolerable and the latter seem insignificant and trivial. The skill of the American farmer, supplied as he is with the most ingenious and graceful and effective machinery, has become an object of admiration and imitation.

The well-organized home of the American farmer is looked upon as a model. The place filled in the community by the American farmer is considered so important and honorable, that other nations inquire how it has been attained. The crops of the American farmer are looked upon as so sure that all anxiety with regard to the supply of food for people less favored has passed away.

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Besides feeding nearly fifty millions of people the agriculture of our country has supplied our commerce with a very large proportion of our exports to foreign countries. Of the aggregate amount of our exports for eleven months, ending May 31, 1879, valued at $635,042,078—the agricultural industry furnished about $535,813,179. The value of the cattle exported during that period was $2,897,846; of corn, $43,610-441; of wheat, $90,700,598; of flour, $23,000,854; of cotton, $173,629,022; of beef, $7,120,000; of cheese, $11,737,728; of lard, $28,068,490; of pork, $4,620,000; of grass-seed, $2,000,000; of tobacco, $23,440,000.

The effect of this contribution to our export trade is incalculable; and it has done so much towards restoring us to that financial stability and prosperity and honor of which, as a people, we ought to be proud, and for which every prosperous man ought to be grateful—that I turn with unusual pride and satisfaction to the record which American agriculture has made for itself during the last year.

This unusual and extraordinary prosperity is due undoubtedly to many causes, both natural and artificial; the natural causes being our diversity of soil and climate, the variety of our crops, and the economy with which new and fertile lands can be cultivated; the artificial causes being the advantages of local and general markets, and the relations established between the farmer and the soil he cultivates by the independent ownership of land, under the laws of our country. To this last cause I attribute much of that elasticity and energy which the American farmers manifest in occupying new lands, and in the cultivation of crops adapted to the markets they can reach. It were not easy to tell the strength and stimulus which comes through the ownership of the soil, to him who occupies it, has fixed his home upon it, and looks to it for his means of subsistence. It is to the division and sub-division of the land, almost as much as to their devotion to the institutions of learning and religion, and their determination to secure all social and civil rights, that our fathers owe their success in establishing free government on this continent. They had the Anglo-Saxon love of land, but, above all this, they had the Anglo-Saxon's love of individual independence; and landed monopolies, entail and primogeniture were especially odious to them. They established, in the earliest colonial days, a system of land-holding, so simple, so exact, so easily managed, that it has become the example which all republican governments follow. They established a public registry of deeds, and provided for an easy and recorded transfer of landed estates from hand to hand—as easy as the transfer of personal property.

The State which they founded became not only the home of civil and religious freedom, but of small landed proprietors also. When they struck for freedom, they struck for the sacred rights of their own homes, which had become scattered throughout the length and breadth of the land, and were the nurseries of a hardy, independent, sturdy race of Puritans in religion and Roundheads in politics. They were, indeed, the lords of the soil, and were as unconquerable in their defense of their little farms as the great landed proprietors of their old homes were in protecting their immense estates from invasion or popular revolution. The feudal tenure of England really never gained a foothold here. But the commercial tenure which took its place gave every prosperous member of the community an opportunity to establish his own little kingdom, and to dispose of or change it at his pleasure.

The temptation to secure land under these circumstances became irresistible The mechanic labored to secure his homestead, the merchant was never satisfied until he had purchased a farm with the surplus profits of his commercial adventure. The professional men of the day—the lawyer, the clergyman, the physician—all owned and cultivated their lands, which they were proud to occupy. And with this American system, as it has been called, went a multitude of civil rights and privileges and opportunities which were never lost sight of by those who made up and supported and

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organized the community. The occupants and owners of these farms were the pillars of the church; they filled the town offices; they took their places in the legislature and made laws for the Commonwealth; they took part in the town meeting with its stormy debate and its free ballot; they aspired to high office and exercised the right of beating and being beaten at the polls. The schoolhouse, the library, the lecture-room, they erected for their mental culture, the church for their moral and religious elevation.

They founded a system of state and society here which required of them and requires of us also a liberal expenditure, both for public and private necessities and luxuries. In a community founded as they founded theirs, taxes must necessarily be somewhat heavy; personal expenses must be somewhat large; the adornments of home must be provided for; the public entertainments will be enjoyed; the children must be well clad, provided with books, and supplied with a good education. And this is the American system of land-holding, with all its duties, privileges, and opportunities—a system which the statesmen of the old world study with profound interest and great care. It may be attended by a great deal of careless and unprofitable and unskillful farming, as every other system is,—but it produces great results and is the foundation of great public and private prosperity.

Our attention is often called to an analogous system of land-holding established in France by the Code Napoleon more than three-quarters of a century ago. But, engrafted as this system has been on a people unused to it and ignorant of its effect upon the political economy of the state, it has not secured those popular advantages which, in our own country, led the eminent French philosopher, De Tocqueville, to attribute to it the stability and vital force of our institutions—a lesson learned here, and not in France. In accurate and economical farming, we may perhaps learn a lesson from France. In her area of 207,480 square miles, not larger than the largest State in the Union, her production of local and staple crops is enormous. Her wheat crop equals our own. Her cattle and horses almost reach our number, and her sheep outnumber ours. With a thrifty population, among whom wealth is quite generally diffused, her resources in war and in peace are unbounded; and her national vitality is the admiration of the civilized world.

That much of this agricultural prosperity is due to the fact that the people devote their energies to the cultivation of small farms, there can be no doubt. But it should be remembered that the state of society which goes with this system in France differs so entirely from our own that she furnishes no such example of popular intelligence and personal independence as is found in the United States. There the home known to the American farmer is not found. The American farm-house is almost unknown. The peasantry gather for the night into crowded towns away from their lands, and go forth by day to till their few outlying acres. The demands of the State upon them are not large. They are seldom overtaxed, except in time of war. They are tempted by none of the honors or emoluments of public service. They aspire to no civil distinction, and, even while organized as a Republic, they are warmed into no personal ambition, and as a social organization furnish no example which their own philosopher and publicist can commend as a guide to the civilized world.

It is true they are citizens of a Republic, and are owners of the soil on which they live; but it is a Republic without the traditions of freedom, a soil divided among them by violence before they had reached the point of citizenship. And I think the most that can be said of their civil organization is that their approach to republican government has been largely through their system of land-holding, more largely than through any lessons taught them by their social and political reformers.

But it is in England that this question of land-holding is most earnestly and carefully discussed at the present day; and it is there that its solution involves the most

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momentous consequences. The feudal tenure still prevails so largely in the United Kingdom that the integrity of the government seems to depend largely upon its preservation. The inheritance of large landed estates, the protection of those estates by entail and primogeniture, their preservation by every support which the law can throw about them, are all objects which the Englishman has deeply at heart—feeling, as he does, that upon the power of a nobility based upon such possessions depend the safety and power of the throne. Great as her commerce and manufactures are, and powerful, she knows that the tie which binds those engaged in these great industries to the Government which protects them is but feeble when compared with the devotion of a great class who cling to their lands and their homesteads, and enjoy the sense of superiority which fills the breast of him who, under the constitution and the laws, is counted one of the lords of the soil. It is upon land-holding of this description that the liberals of England now make war, upon a system which to their minds stands opposed to every popular right and privilege for which they contend.

More than ten years ago, John Bright predicted to an audience in Manchester that the time was rapidly coming when the "American system of land-holding" would be adopted by a reformed British Government. Mr. Gladstone presented this system to the minds of the Irish people, as the next step in his endeavor to regenerate that island, after the disestablishment of the English Church there. The clamor of the most violent and radical of the liberal leaders has been for reform in the direction of a proper distribution of the land among the people. In parliament, at the hustings, at agricultural meetings, the debate is going on—and the question may be said to be the one which divides the popular mind more distinctly than all others, and more constantly occupies the thoughts of the leaders of public thought and the guides of public affairs.

In reply to the opinions expressed by Mr. Gladstone and his associates, Lord Derby long ago attempted to show by figures that the distribution of land among the people of the United Kingdom was as liberal as that to be found anywhere on the face of the earth. More recently, however, Lord Hartington has taken up the question and has most earnestly pointed out the dangers which lie in the way of continuing a system which, according to him, "exists in no other country in the world." As the leader of the opposition in the House of Commons, and as one who, "not only from his character and high position," but "from the social post which he occupies as the eldest son of one of the great proprietors of the soil," "must necessarily exercise a great influence over public opinion," his views are looked upon as of the highest importance. It is charged upon him that in a very remarkable speech recently delivered he has "prepared the country for the belief that the system of English agriculture is not formed on what he calls a natural principle, but, supporting three classes of the community, is one which has failed in consequence, and will never be restored"—these three classes being: 1, The proprietors of the soil; 2, The farmers, an important portion of the great middle class; and 3, The agricultural peasant.

In replying to this extraordinary statement Lord Beaconsfield declared that there is no tenure of land which can be devised except on the condition of furnishing three incomes.

Compared with "peasant-proprietorship," which means small land-holding in the mind of the Premier, the tenant-farming of England seemed to him to be eminently successful. The peasant proprietor buys his farm with his hoarded and invested wages, or with borrowed money, upon which the interest must be paid; and that is the first income. The erection of necessary buildings, the supplying of tools and implements, and the stocking of the farm must all be paid for from the earnings, and that is the second income. He must be clothed and fed from the receipts of the farm, which, together with the support of his family employed with him, constitute the

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wages of the farm, and that is the third income. Under peasant proprietorship these three incomes go to one class; under tenant-farming they go to the three classes already designated. "The number and the variety of classes in England," he adds, "dependent upon the land is the source of our strength."

"They have given us those proprietors of the soil who have been the creators of our liberty, in a great degree, and the best securities for local government. They have given us the farmers—the most important portion of the great middle class—and they have given us, lastly, the agricultural peasant, whose lot is deplored by those who are not acquainted with it, but who have, to my mind, during the last forty years made more continuous progress than any class in her Majesty's dominions." The assumption of Lord Beaconsfield that it is better policy for a farm to support three classes in the community rather than one simply indicates his recognition of class as a political necessity —and his entire ignorance of the independence of him who, owning and cultivating his own land in this country, not as a peasant, but as a citizen, combines the three classes in one, and represents what an American can point to with so much pride as the citizen-proprietorship of his own country.

For well-organized society, as we understand it, there is no necessity for three classes—for the citizen who owns his land here constituting in himself this trinity of society which the Premier admires so much, being literally the "three in one," supplies all those forms to the State; the love of liberty, the love of the land, the love of progress, which are supplied Great Britain by the proprietors, the farmers, and the peasants acting in separate capacities. Instead, however, of realizing the possibility of such proprietorship as this, and finding in it a remedy for the evils he had depicted, Lord Hartington takes an early occasion to state that he has no desire to alter the land laws "for the purpose of encouraging the growth of a peasant proprietorship." "There were many persons," he said, "on all sides of politics, who thought that a considerable number of small proprietors would be a great advantage, but, with the imperfect consideration which he had been able to give to the subject, he had never laid down the doctrine that the existing tenure of land in this country (England) should be altered, or that anything should be done to encourage any other tenure." And so the discussion ended, and large proprietorship and tenant-farming still remain.

The result, however, of the inquiry and the almost universally-recognized fact that the agricultural interests of England are suffering, and that both proprietor and tenant fail to receive their reward—one for his capital, and the other for his labor—have brought about the appointment of a commission who are now in this country inquiring into the sources of agricultural wealth here, the methods by which agricultural products can be raised and exported profitably to the English market—and I trust into the tenure of land which constitutes our citizen-proprietorship. I doubt not they will discover in the cheap and luxuriant grazing lands of Texas the source of our profitable production of beef, and in the fertile valleys of Illinois and Iowa and Indiana the profitable grain fields from which our own people and theirs are fed. But I would have them study also our tenure of land, and learn the "great advantage" of "a considerable number of small proprietors" over that system of land-holding which in their own country is generally declared to be a failure. This system I have already described—and I repeat that it should be called, among the various systems now recognized and discussed, the *citizen-proprietorship* of the soil.

The question of the capacity of this system to support a great rural population on American soil is the *American Problem* to which I have already referred. That it encourages and fosters a spirit of freedom, and is managed by an intelligent and ambitious body of citizens, and is promotive of social and domestic peace and happiness, two centuries and a half of colonial and national life have satisfactorily demon-

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strated. That it supported an industrious and hardy and educated people in the early days of our Republic, before other industries had been established here, is well known.

The question now is—will it continue to prosper under the increased demands of our own day, and enable the land-owner and cultivator to meet the demands made on him by the public and private wants incident to American civilization. Tenant-farming in England has failed; the present proprietorship of France offers no temptations to us. Will our own system continue to prosper, and amidst all obstacles be accepted as the successful agricultural system of the world—a system supporting not a peasantry, but a body of citizens enjoying all the rights and privileges which free citizenship can bestow? I am aware of the discouragements under which our agricultural population is now laboring—dull local markets, small profits, and heavy expenses. But I cannot forget what industry and economy accomplished for our ancestors, who first occupied this soil—and I see no reason to doubt that, as it was with them so will it be with us continually. That an ingenious application of labor to a small homestead will meet with an ample reward I cannot doubt. The exercise of those virtues and faculties which give success in other branches of business must inevitably succeed in this.

A life thus profitably occupied means a life of frugality, foresight, prudence, industry, and the most careful calculation. It furnishes no opportunity for the joy of successful or the despair of unsuccessful speculation. But it does provide a sphere in which self-control may lay the foundation of a contented and happy home, and a life of usefulness and happiness, and prosperity. I am the more encouraged to state this from the fact that those who make this the land of their adoption are eager to possess the abandoned farms of our own people, and find in them all the prosperity and comfort they desire. I know many an outlying and idle farm from which a fair fortune was reaped in a former generation, and from which a crop of strong, capable and useful men has been sent forth to take part in the business of the world. Is this thing impossible now? The methods may have changed—the advantageous localities may have changed—the markets may have changed—the economies of the business may have changed; but the opportunities for success have not changed. I am entirely unwilling to believe that a farm properly selected and properly managed, with reference to soil and markets, may not remunerate the cultivator now, as it did formerly. And I urge upon all individuals and associations into whose hands are committed the theory and practice of agriculture in this country, to encourage that agricultural management which will remove the question of our system of land-holding and farming beyond a doubt, and place it firmly among the prosperous industries of the world, and recognized as such by all men.

And now, gentlemen, the existence of this society indicates the desire of the farming community for investigation, comparison, education in all the important branches of agriculture. That the desire was created by the necessity I cannot for a moment doubt. The simple and easy farming of the fathers prospered under the exercise of industry, economy, good judgment, and common sense. But it is not so now. With these faculties the successful farmer can hardly expect to succeed to the full measure of success, unless guided by the best rules laid down by those who have endeavored to apply the results of careful scientific investigation to their work. It is economy which succeeds now; the economical use of labor, of all the forces used on the farm; the economical use of manure and all fertilizers; the economical feeding of animals; the economical management of the domestic affairs of the farm.

Carelessness and extravagance cannot succeed. The unsystematic farmer may live, but he cannot thrive. But he who, with an enlightened mind, lays down a definite plan of industry and follows it will never be betrayed by that calling which has

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always responded and will always respond to the earnest endeavor of those who pursue it with wisdom and devotion. We may be inclined to question the value of many of the modes of agricultural education which have been adopted in our day,—but let no man, who has the welfare of the country at heart, discourage the attempts which are made to cultivate and inform the minds of those who hold in their hands the most important of all our industries. The Agricultural Society may not display always an encouraging record of the crops or the applied labor of a farm, but it will inevitably rouse a spirit of emulation and excite ambition, and set an example which will be felt in the community. The Farmers' Club may arrive at no conclusion, may begin a season with discussion and end it with discussion, and decide no question under debate; but it will drop a hint or present an experiment which, being accepted by some bright and thoughtful member, will lead to a long experience of successful farming.

The Agricultural College may not send a class of practical farmers into the community and upon the land each year; but it will educate some keen and capable and observing youth, who will enter the field of farming and so cultivate it that the community will learn to have confidence in his work, and will discover many a useful rule written down on his well-tilled and well-managed acres.

As the wants and demands of American society increase, it will be found that the American system of land-holding requires that the American system of education be carried into this occupation as well as into all others. And it will also be found, I think, that they who have succeeded best in arranging and tilling their farms, and supplying a market, have instinctively adopted rules of husbandry which education offers to all who ask them of her.

I urge, therefore, upon you a constant spirit of inquiry, a profound respect for every form of agricultural education, remembering that the knowledge which you possess was wrought out for you by your fathers, and that a still more accurate knowledge is the best legacy you can transmit to those who succeed you as the citizen-proprietors of the American soil.

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WORK WHICH A NATIONAL AGRICULTURAL ASSOCIATION MAY DO:

A LECTURE

Delivered at the Organization of the American Agricultural Association, December, 1879.

BY

WILLIAM H. BREWER,

PROFESSOR OF AGRICULTURE IN YALE COLLEGE.

Our Secretary has kindly invited me to read a paper; it will be but a short one—long enough, however, to express my hearty sympathy with this new movement, to add my mite to the momentum of its starting; to say a word on what I feel should be the function of this new organization, and the direction in which we may expect it to do its best and most useful work. I will confine myself to the ten minutes allotted me.

When I say "its best work," I mean actual work and not mere talk. Nature has indeed been lavish in her bounties to this favored country. We have a broad domain, and fertile soil, and genial climate, and great mineral wealth, and rich forests, and a robust and enterprising population, and a liberal government, but she has lavished on us as a people also "the gift of the gab"—*that*, we need not cultivate here, for the world will ultimately judge this new society not by its talk but by its work; not by what it says it will do, or what it thinks somebody else ought to do, but by what it itself actually does.

Moreover, our work must be positive rather than negative. We may grumble at other and older societies; we may find fault with the Agricultural Department at Washington, we may "pitch into" things generally, but all such talk will not make *us* a prosperous society, nor inspire confidence. Therefore, it is well now, as we stand on the threshold of our existence as a society, to look our difficulties squarely in the face, in order that we may the better meet them and the more surely overcome them.

The first fact that faces us is, that there is already in the country a great variety of organizations having for their object the promotion of our agriculture in some way; of increasing the products of our soil, or else in improving those persons who are employed on the land. These organizations amount to some thousands in number and are very varied in their scope and intent, so varied, so useful and so numerous, that many of us have wondered as we have received the circulars relating to this new call, how we are to get the time and thought to devote to still another one. Beginning with the humble and simple, we rise and branch out by these organizations until we already reach, apparently, the outermost limits of the subject.

We have first the humble but useful farmers' club of a country neighborhood, next town agricultural societies, county societies, State societies, and regional societies which embrace several States (as for instance the New England Society). We have horticultural societies without number; forestry associations; tree planting clubs; we have

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granges, and State boards of agriculture, and State agricultural experiment stations; we have agricultural schools and experimental farms; we have cotton growers' associations, and cane growers' associations, and tropical fruit growers' societies; we have associations of dairymen; we have societies, associations and clubs for looking after the breeding of certain kinds of live stock: Short-Horns, Devons, Ayrshires, Jerseys, Berkshire pigs, Merino sheep, poultry, rabbits, pigeons—these and other breeds, each with its special organization; then we have horse breeders' associations, and trotting associations, and dog-shows; we have an agricultural department at Washington, and commissioners to investigate cattle diseases, and swine diseases, and cotton worms, grasshoppers, etc., etc., to the end of a very long chapter.

Suppose, now, that we can justly criticise *methods* of *some* of these institutions, *many* of them surely are doing a good work and doing it well. Some are already old, dating back into the last century; some as local as a neighborhood, others as wide as the nation, and already *all are at work;* they have an abundant literature, with all the machinery and facilities our modern civilization affords to diffuse their good effects among the people.

Yet I believe that in addition to all these, there is room and a place for a new National Agricultural Society.

But if this new society has any reason for being, it is to either do work already begun better than it has heretofore been done by other organizations, or else it must do its work essentially on these wide and general questions in which all parts of the Nation are interested.

Now, if this be true, we can hardly hope to hold a fair unless Nation and States combine to make it a success by liberal appropriations from their respective treasuries—a very uncertain hope, indeed. From the very nature of our case, if such wide co-operation cannot be secured, the fair will be but a local exhibition, perhaps inferior to many other strictly local ones of less ambitious pretensions. The experience of the various "World's Fairs," even our own Centennial Exhibition, shows this.

Some agricultural products can be got together by almost any one, but a National Exhibition is something very different.

Again, our national domain is so wide—our climate, soil and productions so varied—that naturally there is a wide diversity of local interests. In the Northwest, the cereals; on the Plains, cattle; in California, wool and wheat; in the South, cotton, etc. And in the struggle of modern competition, these different local interests often stand in antagonism to each other as regards national policies towards each, as witness the fierce strifes over tariffs, transportation, etc. This has led ever to war, from the Whisky Insurrection in Western Pennsylvania in 1794, to the last great war. However much we may try to ignore this fact in our speeches at any truly national gathering, it exists, nevertheless, and must exist from the very nature of our national greatness, and it must not be forgotten as an important factor when discussing the function of a National Agricultural Society.

Agriculture is both an art and a science. The *art* of agriculture is very old, almost as old as the human race,—the *science* of agriculture is very young, almost as young as some of the men who hear me speak.

Before the modern means of transportation were devised, and before commerce had so placed all civilized nations into one brotherhood, when regions, separated from each other by even moderate distance, did not and could not stand in direct agricultural competition, when agricultural methods were simpler, and society's wants were also simpler,—then the *art* sufficed very well to feed and clothe the people as they then lived. But now, when distant regions stand in sharp competition with each other in the markets of agricultural products, the *science* must play a more important part. The *art* still varies with the locality, with the soil, climate, the traditions of the

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people, and the thousand and one local conditions which control the agriculture of any particular place. The art is local and changeable, but the principles of science are fixed and general. The art must be changed or modified with each new invention, with new facilities for transportation or production, but scientific principles, remaining fixed, may, however, be applied in new directions with the new need or new conditions, or it can be applied in new ways to remove old difficulties.

Before the use of steam, and before the modern means of transportation was devised, the Eastern States and the West stood in no competition with each other in feeding the sea-board cities; one nation stood in no sharp competition with another in this respect, and thus the *art* sufficed except in unfavorable years when short crops produced local distress, and if this was too severe then local famine adapted the number of mouths to be fed to the means of the local region for feeding them. As already stated, our first internal political troubles grew out of the localization of agricultural production. The grain grown west of the Alleghanies could not be profitably carried across the mountains to Philadelphia and the East except in the concentrated form of whisky—the people had to have *some* commerce, *something* to *sell*, or else relapse to barbarism, and when a tax stopped their only chance of marketing a salable product, then came an insurrection. How changed now, when it costs less to transport a barrel of flour over that same route than it practically does to get it carted from the neighboring store to our dwellings!

Within a century embargoes have been laid in one State to prevent the home-grown wheat from being carried into another, even in small New England; now the wheat of Minnesota competes with that of Kansas and California in those very States, and California and Russia jostle and crowd each other in the wheat marts of Western Europe. If, therefore, New England farmers are to hold their own in the struggle (and I am glad to say that they do), it is because of the aids modern science has given them, because the exact and refined methods of science has been introduced into this old occupation, which had heretofore remained but an art since Adam earned his bread by his sweat. If California will continue to compete with the Black Sea, and expects to remain successful, it must be because she brings superior knowledge as well as superior skill to her aid.

Hence, it seems to me, that this indicates the direction in which this, our new and *National* Society, must do its best and greatest work; otherwise it will fail of its high aim. To escape being a mere local affair it must expend the most of its strength in advancing the science of agriculture and in disseminating its knowledge among those who till the soil or produce our stock. In this work it may be an honor to our nation and a blessing to our farmers.

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CORRELATIONS OF ANIMAL FORM:*

A LECTURE

Delivered at the Organization of the American Agricultural Association, December, 1879.

BY

DR. MANLY MILES

OF NEW YORK.

There are two methods of determining the general characteristics of animals, with reference to the direct return that may be reasonably expected for food consumed, and the relative value of the product obtained.

The first consists in the study of ancestral characters, which is facilitated by a list of the ancestors in the form of a *pedigree*. It is well known that the young animal, at time of birth, possesses no characters that have not been derived from its ancestors, and that it inherits every character and quality of every ancestor, near or remote.

This method of determining the quality of animals will not be considered at the present time, as its importance demands a separate discussion for its thorough elucidation.

The second method of ascertaining the qualities of animals consists in an examination of the external characters of the animal itself—the qualities that are manifest to sight and touch—as they serve to indicate the structure and functional activity of the internal organs, and particularly those of nutrition, on which the value of the animal for every useful purpose depends.

Observation has shown that there is a marked relation existing not only between the several parts constituting the general form of the animal, but also between peculiarities of form and the general and special characteristics.

These relations have been discovered by practical men who have not been interested in formulating the laws of animal growth and development, but have contented themselves with the well-known fact that, with certain peculiarities of form, they were enabled to obtain a high development of corresponding qualities that added to the value of the animal for a special purpose.

The far-seeing men who made our improved breeds what they are, were acquainted with many practical facts of this kind. Bakewell, Booth, Bates, Webb, Ellman, Quartly, and many others whose names are associated with the improvement of all kinds of animals, were constantly studying the relations of the form of their animals to the most desirable and useful qualities.

Bakewell, it is said, killed some of his best animals that he might determine the relative development of their parts and the progress he was making in their improvement.

In the improvement of his Long Horn cattle and Leicester sheep, as producers of

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*Dr, Miles' lecture was illustrated by portraits and diagrams of animals, and was delivered without notes. It was in the main an explanation of and comment on the illustrations—so that the shorthand report here given only presents an outline of it.—ED.

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meat, he aimed to secure the largest return for food consumed, and the greatest possible proportion of choice parts in the carcass.

Persons who have had a long training in buying butchers' stock, or animals for feeding, will readily decide as to the quantity and quality of the flesh of a fat animal, or they will determine with great accuracy the feeding qualities of an animal that is only in store condition, but they cannot always give a satisfactory reason for the opinions which they have formed, as it were, intuitively.

These relations of form and qualities, familiar to practical men, which they are unable to define or explain, are well-known likewise to men of science—comparative anatomists—who have enunciated what is known as the law of correlation.

This law may be briefly defined as follows :—when there is a marked development or modification of any particular part of the body, it is usually accompanied by a corresponding change in structure or function of some other part.

It will not do to assume that the variation in one part is the cause or effect of the change in another part, as both modifications of structure or function may be produced by a common cause.

The law of correlation is simply an enunciation of the fact, that one change or modification is accompanied by another, without attempting to trace the relation of cause and effect.

This is what has been called by French anatomists, the *balancing* of *organs.*

The Kangaroo, for instance, has long hind-legs and correspondingly short fore-legs. The Bat has fore-fingers enormously extended, to which the web forming the wing for flying is attached, while the other members are remarkably small.

In the Carnivorous Mammals—flesh eaters—the sharp trenchant teeth are covered with enamel—the condyle of the jaw is transverse, so that the lower jaw has a vertical motion only. There are bony prominences of the skull for the attachment of powerful muscles,—the stomach is simple, with many corresponding peculiarities of other parts of the alimentary canal,—the feet have claws and are used, to a greater or less extent, for the purposes of prehension, as well as for locomotion.

The Ruminants, among the herbivorous mammals, furnish marked instances of correlated structure. Their teeth have flattened crowns with irregular folds of enamel making a rough, grinding surface—the condyle is flattened so that the jaws have a free lateral motion—the horns when present are attached to the frontal bone, and they are the only animals with the horns so placed. Their feet, used for locomotion only, are terminated by hoofs. The stomach is complex and capacious and the alimentary canal is longer in proportion than in the Carnivora.

The Rodents—gnawing animals—have chisel-shaped incisor teeth, with the enamel on the outer surface, so that they are kept sharp by use. Their teeth grow continuously from the root, so that they must be constantly used to keep them worn to the proper length. The molar teeth have transverse folds of enamel on their flattened crowns, and the condyle is flattened laterally, so that the lower jaw has a to-and-fro motion. The stomach is simple—the alimentary canal has cœcal appendages. The feet terminate in claws, and are used for prehension as well as locomotion.

Without extending our descriptions of the several groups of animals illustrating in their structure the law of correlation, allow me to close this part of our subject by giving a remarkable instance of its application. Several years ago Prof. Owen received from New Zealand a fragment of bone about six inches in length. On examination, he pronounced it to belong to a bird somewhat resembling the Ostrich in form but much larger—with a large and powerful beak fitted for feeding on roots—wings rudimentary—feet fitted for scratching, &c.

As there was no known bird answering this description, it was thought by many that Prof. Owen was making a mere guess in regard to this fragment of bone—but the

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result showed that he correctly predicted the general habits and structure of a bird now extinct. Subsequent researches in New Zealand brought to light nearly complete skeletons that enabled the great anatomist to demonstrate the correctness of the inferences he had drawn from a small fragment of a single bone.

Farmers should be particularly interested in this law of correlation and they should study its applications in the details of structure and function, that they may be enabled to form correct opinions in regard to the qualities of their animals from an examination of their external characteristics.

In the dairy breeds the relations of correlated structure are different from those that prevail in the meat-producing breeds; and in animals adapted to work we find still different applications of the same law.

As these diverse phases of correlative structure present too wide a field for discussion in a single evening, we will confine our attention for the present to the meat-producing breeds, of which the Short Horns may be taken as representing the type of the class.

The general form of the body representing the highest degree of excellence in all the meat-producing breeds may be described as somewhat quadrangular, the outline representing approximately a parallelogram with the corners nicely rounded and without prominent bony projections.

All animals intended for the butcher should have a sound constitution, as the production of flesh involves work in the system that is quite as severe as that expended in drawing a load, or in moving at a rapid pace on the road.

Good feeding qualities are needed—that is, the animal must not only give a good return for feed consumed, so far as quantity is concerned, but it must furnish a product of the best possible quality. Early maturity is one of the most important characteristics. Experiments show conclusively that young animals give a much larger return for food consumed than those that have matured, so that the greatest profit is made in feeding during the early periods of growth.

In connection with a good general quality of flesh it is also desirable that the carcass furnishes the largest proportion of choice parts.

A general idea of the qualities of an animal may be formed by a glance at the proportions presented in the outline of its body. If the body is disproportionately long, without corresponding depth and thickness, a weak constitution and slow feeding quality may be expected, the latter quality being also associated with late maturity. The opposite extreme in proportions—an excessively short body with great thickness and depth—would indicate remarkable feeding qualities, and the fat-producing functions may even be in excess. A happy mean between these proportions will be found the most profitable and satisfactory.

In aiming at the production of the largest proportion of valuable parts in the carcass it must be remembered that the cheap parts cannot be entirely dispensed with, as head, neck, legs, &c., are essential to the well-being of the animal. These should, however, be diminished as far as is consistent with the health, constitution and stamina of the animal.

In the study of form one of the first points to consider is the bony frame. The bones are not valuable as food, and it will be readily seen that when they are in excess they diminish the value of the carcass as a whole from their weight. There is, however, something of greater importance to consider in this connection—it has been observed that animals with large bones are slow feeders, giving a poor return for food consumed, in connection with late maturity. In many instances these characters are inherited, and therefore unavoidable obstacles to profitable feeding. This defective condition of the system, consisting essentially in imperfect nutrition, of which the large bones are but an index, may be induced by a low and innutritious diet when the animal is young, and if long continued may become a marked characteristic that will last throughout life.

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THE QUALITY OF AMERICAN SEEDS.

BY

DR. ALBERT R. LEDOUX,

OF NEW YORK,

LATE DIRECTOR OF THE NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION.

MR. PRESIDENT AND GENTLEMEN OF THE AMERICAN AGRICULTURAL ASSOCIATION :—

To every man there comes at least one day in all the year for thoughtful retrospection —a day which checks him for a moment, in his pursuit of wealth and pleasure, or in his battle with adversity, and bids him THINK—a day distinguished from its hurrying fellows by something special, something its own. It may simply be his birthday, the day when he left his father's house to make his way among strangers, or perhaps that day when the shadow of the Dark Angel fell across his threshhold and Sorrow entered in to sup with him.

Such days should not only be spent in looking back, but also in hopeful looking forward. The seed of reflection should never yield a harvest of barren regrets, but of strong resolves and earnest endeavors.

Nations, as well as men, have these anniversaries.

As I stand here to-day I cannot but look backward over our country's history. I see many a red-letter day marking some grand step in her social, political or material progress, and many a day like many a name, now hidden among its fellows, which our children will do themselves honor in remembering. But, sir, I feel that no day has dawned more pregnant with *possibilities* for our Nation's weal than the birthday of this, your Society.

I cannot but look forward and see a long line of benefits which must surely accrue to these United States if you secure in your work the earnest co-operation of all who feel an interest in the science of agriculture.

With a deep sense of the honor you have done me in requesting my presence here to-day, I respectfully ask your attention to one of the most vital and practical of the many subjects with which our farmers have to deal.

I am amazed, sir, when I take up even the best of our agricultural journals to see how little, comparatively, is said about seeds and seed-testing. The letters and advice about soils, tillage, fertilization, etc., are many, but how few seem to realize that unless the seed is sound and pure, their labor is wasted or doubled.

There can be but two plausible reasons assigned for this apparent indifference. Either our seeds are so pure and sound as to warrant this apathy, or else the attention of our farmers has not been called to the importance of the subject.

In April, 1869, hardly more than ten years ago, a farmer in Saxony forwarded to Professor Nobbe, Director of the Experiment Station at Tharand, some four or five samples of grass seed, which he had bought, and asked for their botanical identification.

The examination revealed the surprising fact that *scarcely 30 per cent. of one of the samples at least was of the species indicated by the label attached.*

This discovery led Dr. Nobbe to undertake an examination of the stock of promin-

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ent seed-houses in Germany, and the results, published in his work of over 600 pages, have been the means of creating an entirely new branch of scientific investigation for the student, and for the farmer another protection against intentional or unwitting deception.

Among the visible results of Prof. Nobbe's work is the establishment in Europe of no less than 45 Experiment Stations, whose chief duty is the examination of commercial seeds. Nobbe himself has tested over 5,000 samples.

The unseen benefits of such work, who can number? We can sum up the results of Dr. Nobbe's first series of investigations as follows:—

The average per cent. of pure seed in commercial samples was found to be 59.

The average per cent. of foreign substances was 41.

Of the 59 per cent. of seeds which were what they were represented to be, only 18 per cent. were capable of germinating.

A sample of orchard-grass (*Dactylis glomerata*) contained the seeds of 45 other plants.

A sample of meadow fox-tail (*Alopecurus pratensis*) contained 95 per cent. of dead seed.

Three tons of seed, sold as red clover (*Trifolium pratense*), contained two tons of yellow clover *Trifolium agrarium*).

Fig. I.—Seed and chaff, natural size and enlarged, of meadow soft grass (*Holcus lanatus.*)

Old seeds were renovated by boiling, dyeing and roasting. Weed seeds were stained, and used to adulterate lots of expensive seeds. English seedsmen sold in 1869 over 10 tons of poor turnip seed, disguised so as to represent a more valuable article. In Bohemia and elsewhere large factories for the manufacture of seeds from quartz were running, with large warehouses at Hamburg and other commercial centres.

The quartz grains, colored to order, were selling for $50 per ton, and were largely used to adulterate clover.

An ordinary observer will never detect the fraud, even when the sample is adulterated 25 per cent. with these stones. The flowers of various grass varieties, especially orchard grass, from which the seed had been removed, were frequently sold as genuine grass seed.

Men, women and children were regularly employed in Bavaria and Austria to

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collect from the roadsides and ditches seeds of weeds and grasses of all kinds. These collections were bought by agents, who shipped them to England and elsewhere to be sorted, labeled and sold.

This species of labeling reminds me, sir, of the trick which Mark Twain's companion, Blucher, played upon an aged and unsuspecting relative.

Previously to embarking for his homeward voyage, he gathered a quantity of bones, old iron and pebbles, and spent his leisure moments on the passage in labeling them. For example, one part of the jaw of a horse, he marked "*Fragment of a Russian general.*" Another—a stone—he broke in half, and marked one piece "*Chunk busted from the pulpit of Demosthenes,*" and the other "*Darnick from the tomb of Abelard and Heloise.*"

A mild and comparatively harmless species of deception, while that practiced by the English seedsmen, in the extent and duration of the injury, toil, and loss inflicted can scarcely find a parallel in the history of fraud.

Such are a few of the facts discovered by Dr. Nobbe, and upon which has been builded the science of seed analysis. That a seed shall produce a healthy plant of the proper species, it must be well developed, sound and genuine. All this without considering the time, place and manner of planting, or the method of cultivation.

The student of agriculture should be taught to distinguish good seed from bad, recognize impurities, and identify the germs of weeds. There should be a special branch of instruction in this line in all our agricultural colleges.

Most of you, no doubt, can distinguish at a glance the common grass, grain and garden seeds; but how many gentlemen here to-day can describe the appearance of the seeds of half a dozen common weeds? How many botanists even can identify the most familiar plants by their seeds alone?

I will not take the time to describe the methods employed in experiment station to make a complete seed analysis. I will do little more than name them.

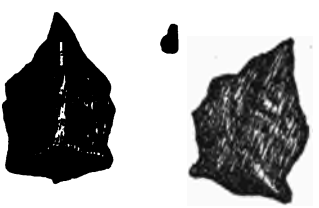

Fig. 2.—Blue-weed (*Echium vulgare*), natural size and enlarged, in different positions. One of our worst weeds.

I. *Gravity.*—From their specific gravity we learn the probable quality and age of seeds. Those gathered before maturity, and those dry with age, are comparatively light. Light seeds produce inferior plants, if any.

II. *Preliminary Examination.*—Good seeds are shiny, smooth and full; have a fresh smell, or none; sink when placed in water; spring upward like "pop-corn," when thrown on a heated metal plate.

Poor seeds often smell musty, and stick together; are dirty, soiling the hands; of a pale color; float when placed in water; are quietly charred when placed on a hot plate.

III. *Determination of Impurities.*—This is effected by separation from dirt, chaff, and foreign seeds, by hand. (I shall call "foreign" all seeds in any sample which are not what the lot was represented to be), aided by certain sieves, special mechanical contrivances, and by the microscope. The impurities are weighed.

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IV. *Identification of Foreign Seeds.*—This requires experience on the part of the Analyst. The standard seed collections of Prof. Hennig, and Nobbe's accurate drawings and accompanying tables, are invaluable aids.

V. *Determination of the Germinating Power.*—Here, too, experience is needed, as well as a knowledge of the habits of different seeds. In nature we find the widest extremes, from the seeds of the cress, radish, &c., which 12 hours after they are detached from the parent stem begin to shoot their tiny rootlets into the soil, to the acorn, cherry, and other fruits, whose duration of "seed inertia" is often two years.

Fig. 1.—Seeds of flax dodder (*Cuscuta epilinum*), natural size and enlarged.

Fig. 2.—Lupine dodder (*C. lupiniformis*), natural size and enlarged.

Fig. 3.—European dodder (*C Europea*) natural size and enlarged.

Elaborate experiments have been made to show that the time required to produce rtificial germination in seeds of grains, grasses and other lesser plants, is 10 days on an average.

The aim of the Analyst is to produce artificial germination under the most favor able circumstances.

An apparatus has been contrived by which the seeds may be sprouted under constant and normal conditions of shade, moisture and temperature. Various other ex pedients have to be resorted to in special cases, such as conducting the experiment in moist sand, in blotting paper, &c. I will not detail them here.

I have upon the table three sets of sprouting apparatus, in which 200 each of red clover, cabbage and orchard-grass seed were placed four days ago, Every other day the sprouted seeds are removed and counted. After 10 or 12 days the experiment is discontinued and certain allowance made for the seeds still remaining hard, though exhibiting no signs of sprouting. The apparatus is made of porous earthen-ware, and allows the seeds to be kept constantly moist, but not to stand in water, which would "drown" them, as we say in the Laboratory. The temperature must remain between 15 and 18 degrees Centigrade.

Having briefly presented the outlines of the work of seed analysis, it remains to illustrate the subject by means of a practical example.

I will take such an example at random from the report of the Experiment Station at Tharand.

From a lot of commercial red clover-seed, a carefully drawn sample of two ounces (59 grams) in weight was taken. It contained: seeds of red clover, 94 per cent.; impurities, 6 per cent.

Of the 94 per cent. of pure seeds, 60 per cent., or three-fifths, were found to be incapable of germinating. The impurities consisted of sand, chaff, and seeds other than red clover. A pound contained no less than 14,400 foreign seeds.

Pursuing the investigation still further, these unwelcome intruders were found to be of 44 distinct species, as follows: Thistle, horse sorrel, sheep sorrel, milkweed, dandelion, knotweed, bottle-grass, knawzel, bladder campion, corn spurrey, star-wort,

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penny cress, rabbit clover, Swedish clover, zigzag clover, hop clover, white clover, valerian, speedwell, blue violet, marsh violet, pansy, rib-grass, plantain, timothy, poppy, forget-me-not, black medick, burdock, darnell, cranebill, goose-grass, spurge, blueweed, wild carrot, ox-eye daisy, pigweed, chickweed, winter-cress, sand-wort, pimpernell, dodder and alyssum.

Fig. 7.—1. 2. 3.
Seeds of Butter-weed (*Erigeron canadense*); 2, natural size; 1, enlarged, dry; 3, enlarged, wet.

While we might tolerate an occasional forget-me-not, pansy or poppy, and might welcome the timothy and white clover, who would want to sow the blueweed, daisy, burdock, darnell and dodder?

Yet this clover-seed was above the average in purity. This average being, as already stated, 41 pounds of pure seed in every hundred.

A sample of hemp-seed contained: pure seed, 93 per cent.; impurities 7 per cent. The foreign seeds were of 45 distinct varieties, including the flax-dodder (of which more anon), and numbered over six thousand per pound.

A sample of French rye-grass contained 31 per cent. of pure seeds, 40 per cent. of foreign seeds, and 29 per cent. of sand, &c.

The interloping seeds numbered over 25,000 per pound.

Fig. 5.—Seed and chaff, natural size and enlarged, of common velvet grass (*Holcus mollis.*)

Fig. 6.—Seed and flower of orchard grass, natural size (*a*), and enlarged (*b*).

Let us go back to the sample of clover for a moment. From the data I have given, we can easily calculate that the farmer who sowed this stuff upon his field, distributed with it the germs of six hundred and eighty (680) blueweeds, twenty-one thousand and

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four hundred (21,400) dodder, and five thousand nine hundred and eighty-three (5,983) daisies per acre, to say nothing of the other useless or hurtful seeds to the number of two hundred and fifteen thousand eight hundred and forty-three (215,843) on every acre.

We can now realize his misfortune; but this is not all. A single plant of blueweed has produced by actual count fourteen thousand seven hundred and thirty-five (14,735) seeds, of which eight thousand two hundred and fifty-five (8,255) sprouted.

Fig. 7.—Buckwheat, with seeds of goose-grass, knot-weed, convolulus, etc.

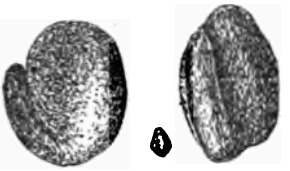

Fig. 8.—False flax (*Camelina dentata*) natural size, and enlarged in different positions.

What a world of trouble all this means! No wonder English farmers have the proverb—

"One year's seeding
Is seven year's weeding."

I turn now to the consideration of American seeds.

I fear, sir, that you will think I have been a long time in reaching my subject, but I deem that some preliminary explanation was necessary. I think that I have said enough to convince you all that, *on account of the wide-spread adulteration of European seeds, if for no other reason, we should at least exercise care and vigilance in our purchases from American Seedsmen.* Especially since they import largely from all European countries. During the year ending June 30th, 1879, the value of garden, agricultural and horticultural seeds imported into the United States amounted to nearly seven hundred thousand dollars.

The exported seeds of the same class were valued at two million one hundred and forty thousand five hundred and thirty-three dollars.

Let any one examine Dr. Gray's Manual, and he will find hundreds of weeds described, which were not native, but have been introduced from abroad. Writing upon this subject, my kind friend, Dr. Thurber, uses, editorially, the following language. In the natural distribution of seeds it would appear that the scattering of the seeds of weeds was most carefully provided for. But, however abundantly these are disseminated by natural agencies, the careless farmer sows them broadcast by the handful, and does what Nature cannot do—*he puts them in well-prepared soil*, where they will be sure to grow. To take an illustration in season. In this very month (of March) hundreds of farmers will be sowing their clover "on the last snow," as many try to do. Next Summer, or later, we shall have from some of these same farmers letters and specimens. The letters will be to this purport:

"A new weed has appeared in our fields, or meadows; threatens to kill out everything else; what is it and how shall we get rid of it? It was never known here before this year; where *did* it come from?" Of course we shall try to answer each inquiry as well as we can. The "Where did it come from?" we can answer now—you carefully sowed it that cool March day with your clover.

I will bring forward one more proof that American seeds are certainly often impure. It is that the European Experiment Stations and botanists are constantly finding weed seeds in importations from America. In Dr. Nobbe's report again and again

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occurs the phrase "Introduced from America," after the description of many species of weeds. You will notice, sir, that thus far I have argued from induction only. I will now proceed to give the results of actual seed examinations.

I must pause just here to do a very pleasant duty. That duty is to assure you of my confidence in the honesty of our great American seedsmen. I find no *manufactories* among them, nor establishments for seed "doctoring."

Impure Clover Seed.

Pure Clover Seed, enlarged.

Among Prof. Johnson's examinations of Connecticut seeds I find no mention of even one "*wooden nutmeg.*"

I have never seen a single specimen of "*shoe-peg oats.*"

Though themselves often deceived and ignorantly deceiving, no class of business men are more upright. To name *one* of them, at least, is to inspire confidence and gratitude wherever there is "GARDENING FOR PLEASURE" or "PROFIT."

After careful inquiry I find that it is not yet four years since the first experiment with a regular sprouting apparatus was made in the United States, and all the tests which I am about to report have been made at one or the other of our two American Experiment Stations. I have arranged the results of fifty-six reliable tests in the following tables:

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I.—AMERICAN SEED-TESTS.

Common Name of Seed.	*Where Obtained.*	*Per Cent of Pure Seed.*	*Seeds in 100 Capable of Germinating.*
Ky. Blue-grass	New Haven	92	5
Red-top	"	55	42
"	Philadelphia	14	46
Orchard grass	New Haven	81	48
" "	Chapel Hill, N. C.	95	67
" "	" "	91	85
" "	Raleigh, N. C.	91	58
" "	Philadelphia	100	69
Timothy	Chapel Hill.	67	62
"	"	70	23
"	New Haven	98	95
English rye-grass	"	94	66
Lucerne	"	100	68
Golden Millet	Rockingham, N. C.	100	40
Red clover	New Haven	94	77
" "	"	..	85
" "	"	..	29
" "	Philadelphia	94	78
" "	"	98	82
" "	New York City	87	93
" "	Raleigh, N. C.	98	79
" "	Durham, N. C.	90	73
" "	Chapel Hill, N. C.	95	83
White clover	Wake Forest, N. C.	97	3
Turnip	New Haven	100	56
"	Weaver's Creek, N. C.	99	94
Radish	New Haven	100	78
"	Chapel Hill	95	98
"	U. S. Com. Ag	100	67
"	" "	100	98
Wheat	" "	100	99
Barley	" "	100	98
Rye	Moyock, N. C.	100	97
Oats	U. S. Com. Ag	100	98
Lettuce	New Haven	100	40
Beet	U. S. Com. Ag	98	81
"	" "	98	62
"	" "	99	89
Mangel Wurzel	Rochester	100	50
Carrot	U. S. Com. Ag	96	34
"	" "	87	57
Watermelon	" "	100	74
"	" "	100	75
Parsnip	" "	100	29
Onion	" "	100	63
Tomato	" "	100	98
Celery	" "	100	24
Broccoli	" "	100	88
Cabbage	" "	100	70
"	Fonta Flora, N. C.	100	100
Cauliflower	U. S. Com. Ag	100	65
Rhubarb	" "	100	16
Okra	" "	100	62

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We will now examine these results with reference to the quality of the samples, the vitality of the pure seed and the character of the impurities.

The German tables of average purity and vitality, based as they are on the investigation of hundreds of samples, will serve to give us an idea, by comparison, of the quality of our American seeds. Few in number as our tests have been, we shall still find the following table of extreme interest, if not perfectly satisfactory:

II.—Table of Comparisons.

Seed.	*Per Cent of Pure Seed.*		*Seeds in 100 Capable of Germinating.*	
	U. States.	Germany.	U. States.	Germany.
Ky. Blue-grass	92	51	5	11
Red-top,	39	25	44	21
Orchard Grass	92	47	65	22
Timothy	78	94	60	82
English Rye-grass	94	95	66	73
Lucerne	100	95	68	76
Red Clover	98	95	70	82
White Clover	97	98	3	65
Turnip	99	97	75	79
Radish	99	98	85	91
Wheat	100	98	99	95
Barley	100	99	98	88
Oats	100	99	98	74
Lettuce	100	96	40	77
Beet.	98	98	77	71
Carrot	91	86	45	59
Parsnip	100	95	29	17
Onion	100	99	68	50
Tomato	100	96	98	77
Celery	100	97	24	32
Mangel Wurzel	100	98	50	71
Cabbage	100	99	85	79
Cauliflower	100	99	65	87

One more table will give us a clearer comprehension of the subject.

III.—Table of Comparison.

Seed.	*Per Cent. of Pure Seed.*		*Seed in 100 Capable of Germinating.*	
	U. States.	Germany.	U. States.	Germany.
Grasses	79	62	50	42
Clovers	98	94	69	79*
Garden Vegetables	100	99	98	86
Grain	99	96	61	66

The averages are obtained from Table II.

* I have omitted white clover in this line.

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The following table shows the *average* obtained by Prof. Beal in a large number of seed tests made at the college farm at Lansing. The seeds were planted in the ground or sprouted between folds of moistened paper.

Seeds.	*Seeds in 100 capable of germinating.*	*Seeds.*	*Seeds in 100 capable of germinating.*
Salsify	14	Bent-grass	5
Onions	47	English rye-grass	5
Cabbage	46	Meadow-grass	2
Lettuce	57	Schroeder's Bromus	62
Carrot	51	Sweet-scented vernal	15
Beet	50	Orchard-grass	50
Parsnip	32	Hungarian grass	56
Cucumber	59	Yellow oat-grass	11
Squash	13	Timothy	69
Red clover	82	Italian rye-grass	21
Bokhara clover	49	Red-top	14
Italian clover	70	Kentucky blue-grass	4
Lucerne	87	Reed canary-grass	4
White clover	88	Meadow fox-tail	4
Alsike clover	64	Crested dogs'-tail	8
Fescue	71		

It needs but a brief glance at this table to show us that Prof. Beal's experiments tend to lower very materially our estimate of the quality of American seeds. I have not incorporated these tests with the others, because Prof. Beal does not state the percentage of pure seeds present in the sample, and because tests made in the soil cannot be as fair as those made in the sprouting apparatus, on account of the additional factors that affect the results; nor can the normal conditions be so accurately observed.

We see that our GRASS SEED is cleaner than the European and its vitality greater. Still there is room for great improvement.

Our CLOVER is cleaner but of inferior vitality. Our GARDEN VEGETABLES are superior in every way. Although very interesting, I cannot expect for these conclusions an unqualified acceptance. Our tests have been too few as yet to give our results an undisputed title to credibility. This the future must—I trust will—do.

It remains for me to speak, in conclusion, of the *impurities* which make up TWENTY-ONE PER CENT. OF OUR GRASSES, AND SEVEN PER CENT. OF OUR CLOVERS. I shall do so very briefly. They are of two kinds, dirt and foreign seeds. Under dirt are classed sand, stones, sticks, chaff, &c. We have already seen what were the impurities in European seeds. Those found in our American seeds are of the same general character. Seeds of SEDGE, PLANTAIN, KNOTWEED, BEDSTRAW, MORNING-GLORY, DODDER and other weeds and poisonous plants have been discovered among samples of clover seed.

In Connecticut the seeds of Red-top were gathered before perfectly ripe and sold as "Blue-top" grass for two dollars per bushel. Such seeds, it is needless to say, never germinated, or at best produced inferior plants.

It is not uncommon in this country to find samples of orchard grass, of which EIGHTY PER CENT. ARE SIMPLY THE FLOWER, CONTAINING NO SEED.

In one sample of clover seed, from a reputable firm, sold as red clover, I found *thirteen per cent.* of *Swedish clover* and *seeds of the* CLOVER-DODDER *at the rate of* SEVEN HUNDRED AND TWENTY PER POUND. This lot of seed I traced far enough to learn that it came from the West and was not imported. It deserves more than a passing notice.

Many of our farmers are familiar with the Flax-Dodder (*cuscuta epilinum*) which by-the-way drove hemp growing out of Central North Carolina and opened the way for cotton culture.

The clover-dodder (*cuscuta trifolii*) is the greatest pest of German farmers.

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Whole sections of country are ravaged by this parasite, and the people have been compelled to abandon the cultivation of a clover. The *cuscuta trifolii* bears flowers not unlike the morning-glory (*Convololus*), and develops perfect seeds. When ripe the seed fall to the ground and send up tiny wiry arms in search of a clover-plant. It is a matter of life or lingering death to the dodder whether or not it finds clover. With unerring instinct it creeps along until it reaches the doomed plant, which it surrounds and covers with a complete net-work of runners. Each runner sends forth *papillae* at every point of contact, which tap and suck-out the life-blood of the unfortunate captive. The accompanying diagram (Fig. X.), will serve to illustrate the manner of growth of the *cuscuta*. It is true that many species of weeds, very injurious in certain climates and soils, are comparatively innocent in others. It would be a fearful national calamity should the clover-dodder obtain a footing in our country.

Fig. X.—Clover infested with dodder, showing manner of attack.

When our farmers found that they were being imposed upon by unscrupulous dealers in fertilizers, they instituted various forms of State control and inspection. In this they were seconded by the better class of fertilizer manufacturers. When we begin to realize the importance of pure, fresh seed, we shall not only experiment for ourselves, as have Dr. Sturtevant and others with such interesting results, but will establish in our broad land not two, but many, experiment stations where the honest seedsman and the cautious farmer can ascertain what they sell and buy.*

* When this address was delivered there were only two experiment stations; since then others have been established

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Such an institution could have saved a former United States Commissioner of Agriculture considerable annoyance. He purchased and distributed throughout the country tomato seed which unbeknown to him had been cooked at a Baltimore canned-goods factory. A sprouting experiment would have shown at once that they were worthless. If it were not for the proverbial majesty and protection of the laws of this city, I should hardly dare remind the New York gentlemen here to-night of the way a Mexican *sold* them—judges, bankers, botanists, preachers and all—sold them Okra seeds, which cost him 15 cents per thousand, as the seeds of a rare and wonderful plant, "Cocatel—Lily of Mexico," at the rate of *three for a dollar*. This happened not three years ago.

I am aware, sir, that I have done little more to-day than throw out suggestions and point to probabilities; that our seed examinations have been too few to warrant absolute conclusions or unqualified generalizations. If my regular chemical work will allow, I shall endeavor to collect facts and figures that will place me in a position by another year to make a report more worthy the importance of the subject.

In honoring me with an invitation to address you, the Chairman of your Committee wrote that he desired me to represent the South. He assigned me a task both great and pleasant. Great, because agriculture is as vital to the Southern States as is breath to the human body. Pleasant, because I can assure you that North Carolina, at least, is taking much interest in your organization.

Though scarcely three years have passed since I was called to the "Old North State," I have had ample means of knowing her planters and farmers. I have also had the honor of meeting most of her leaders of public opinion, and I assure you, gentlemen, that no political strife or bitter memories can longer retard the steady march of improvement which has begun in the South.

Taking into consideration her population, no State has a better managed or more progressive Agricultural Society than North Carolina, and to the National Association I do not fear to pledge Southern encouragement and co-operation.

Mr. President and gentlemen, in the name of our country I greeted you. In the name of North Carolina I thank you for your attention.

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AGRICULTURAL ADVANCEMENT IN THE UNITED STATES.

ADDRESS

BY

PROFESSOR C. V. RILEY,

At the Organization of the American Agricultural Association, December, 1879.*

GENTLEMEN: You have organized a society for the advancement of American agriculture, and he were no patriot who did not wish you success in the good work you have set out to accomplish, or who failed to indorse the noble ambition which has inspired your organization. It is because I sincerely wish you success in your laudable object that I have concluded, in reply to Mr. Reall's repeated request, to suggest in as few words as possible, wherein, in my humble judgment, success is and is not attainable by an organization of this kind.

All nations, in all times, have recognized the importance of agriculture; and in proportion as they have intelligently fostered it have they been prosperous; for the decay of nations runs *pari passu* with decrease in productiveness of the soil. No country is more dependent for prosperity on the products of the soil than our own, and it is doubtful whether in any other this importance is more fully appreciated. One-half of our people depend on agriculture for support, and we are essentially a nation of farmers. By way of comparison, let us glance at what other great nations have done and are doing to advance agriculture, and then at what our own government has done and is doing. In this way we may possibly see more clearly the paths that lead to improvement and advancement, and also in how far an organization like this will be likely to successfully tread and lead in those paths. Taking, for comparison, three of the principal nations of Europe—England, Germany and France—in which I have lived, I ask your indulgence while I state the leading facts, without entering into particulars.

An agricultural department has not entered into the scheme of the English Government, though there has been some recent talk of creating one. Schools have been established, however, which are under the patronage of the Government, and which are intended to promote the knowledge and science of agriculture. There are three of these schools—one in England, one in Ireland and one in Scotland. These are almost entirely self-supporting, as the appropriation yearly made for the maintenance of pupils, pay of teachers, stewards, gardeners, laborers, etc., is inconsiderable. Each of these schools stands on one hundred or more acres and is divided into three farms: 1st, a spade-labor farm of a few acres, cultivated as an example for cottage-holders; 2d, a farm worked with inexpensive appliances, on a scale suited to the great bulk of small rent-paying farmers; 3d, a farm of large dimensions, which is managed with a view to train large farmers.

These schools and farms are under the management and inspection of a general

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* Some passages in this address, of application only when it was read, have been omitted with the consent of the author.—ED.

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superintendent, and we have from the English budget the annual appropriation made to support the same, as follows, for the year 1878:

AGRICULTURAL ESTABLISHMENTS.

Superintendent of Agricultural Department	£895
One Inspector of Agricultural Schools	200
Locomotion and the expenses of the above	300
Total for general superintendence, etc	£895

Or, $4,475 for the expense per year of that which represents with us the Agricultural Department of the Government.

The schools are maintained at an expense of less than $10,000 each per annum. These schools teach the usual English branches of knowledge, together with the theory and practice of agriculture. The English and Scotch schools are normal. The net expenditure for agricultural establishments in England is £3,886, or $19,430.

In every county in England there is an agricultural society or club composed of the resident farmers and land-holders, and these clubs are much after the manner of our local societies in their formation and object. The Royal Agricultural Society of London, is semi-national, though self-instituted and in receipt of no government patronage. It is composed of the leading nobility and gentry of the Kingdom who are interested in the promotion of agriculture. This society has agents throughout the country who make regular returns of the condition of the crops, etc., from which the society makes up its published reports. Agricultural Fairs are held under the patronage of the Royal Society, and premiums awarded in medals and money for superior stock, excellence of products, etc. Its success is due, first, to the limited area of England and the homogeneous character of her agriculture; secondly, to the support of a wealthy and landed aristocracy, and thirdly (and principally), to its appreciation of scientific methods. The indirect encouragement which the government gives to agriculture, as in the support of Kew Gardens, the South Kensington Museum, etc., is an important factor to be considered, for these institutions are powerful, not only in advancing, by experiment, agricultural knowledge, but also in disseminating that knowledge among the masses.

In the German Empire, as now united, no national department of agriculture has yet been crystallized, and I will take the State of Prussia, with which I am most familiar, for illustration.

The Prussian Department of Agriculture is a co-ordinate branch of the Government, being represented in the Cabinet. Its annual appropriation—between two and three millions of dollars—is small when compared with that of the other departments. Its sphere is not only to foster the agricultural interests of the country, but also to take charge of the public lands. These consist mostly of forest land, only a small proportion, scattered over the country in farms of 1,000 acres and upward, being devoted to general agriculture. Most of these farms are rented out, not to the highest bidder, but to wealthy farmers who must be well educated and trained in science. These are bound by contract to conduct the farms as model farms in every respect; to improve the stock as much as possible; to use only improved seeds, and to introduce such machinery as is recommended by the department. But a few of these farms—one in every province—are used as experimental stations, and these are all self-supporting. The products of these farms are marketed and disseminated only upon recommendation of the department. With these experimental farms there is always connected a horse-breeding station, which is not required to be self-supporting, and is, therefore, administered separately, receiving an annual appropriation. Farmers, upon application, are permitted to bring to these stations mares of improved breeds, and are charged only a nominal price when the animals are with foal.

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Either by agreement to do so or from choice, the renters of the public farms accept pupils for training in practical agriculture, while the managers of experimental farms are bound to do so. The pupils pay a tuition fee, and must have some knowledge in agriculture and an ordinary school education. They are soon employed as overseers, and thus greatly lessen the cost of running the farms.

Information tending to promote agriculture is conveyed to the public in a two-fold manner. First, through the official paper (*Amtsblatt*), circulated by the Government, and made self-supporting by the private advertisements that seek its columns; secondly, through the different Government officers in the provinces and counties, the department having control over these last, from the superintendent of the county to the rural police, who are required to gather statistical and other information within their precincts. Where the public good demands vigorous and concerted action, as in preventing overflows, or in preventing the importation of cattle diseases, etc., the department has unlimited control over the entire police force of the precinct, and, if this is not sufficient, the army is obliged to render assistance.

There is no free distribution of seeds except in case of total failure of the harvest over large districts.

The department publishes no annual reports, but frequently offers prizes for the best essay on any subject of importance.

It is part of the duty of the consuls and consular agents in foreign countries to make reports on agriculture and agricultural improvements, to send home new seeds, and otherwise advance agriculture in their own country.

There is a governmental school of agriculture, and also one of forestry. The pupils pay a tuition fee, and must pass examination in science before entering.

The Government offers small prizes at the regular county fairs, and gives free transportation on the railroads under its control, for all objects destined for such exhibitions, while private railroads are required to do likewise, or to carry for this purpose at nominal cost.

The public roads in Prussia are lined each side with a row of fruit or other useful trees, which are cared for by the Government, and private companies that build high roads are obliged to similarly line them. The crop from these trees is annually rented out, and the revenue obtained helps to keep the roads in repair. Finally, farmers are required to remove and destroy caterpillars and noxious insects whenever the public weal demands it. The perfect system of forestry under Government control is, also, worthy of study.

From the foregoing statements it is obvious that, wide as is the scope of the department, it is administered on a most economical basis.

In France there is a Department of Agriculture, which is a part of and connected with the Department of Commerce and Public Works. This department is presided over by a minister or cabinet officer, who is known and designated as Minister of Agriculture and Commerce. In the general budget for the expenses of the French Government, the department, as above organized, receives about $20,000,000 annually, while the annual appropriation for agriculture solely amounts to about 13,000,000 francs, or $2,500,000; but the scope of this department in France, so far as it relates to agriculture, is very large and comprehensive, and includes not only the personnel of the ministry and the machinery of the department, but schools of agriculture, model agricultural farms, appropriations for the introduction of fruit and shade trees, new and valuable seeds of grains, and all products that are likely to find a home in French soil. It includes also the purchase and maintenance, at appropriate stations, of improved stock of sheep and cattle, and of horses, and for the constant renewal of these by the introduction of the best breeds of each.

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They have depots or stations where stallions are kept for the general good. They have veterinary schools and traveling professors of agricultural science, whose duty it is to visit all sections of the country and instruct the farming people. They have schools of trade and arts connected with agriculture.

This department gives encouragement to agricultural and stock exhibitions in public fairs, etc., with premiums for excellence. It encourages the sports of the turf and competition in the speed and endurance of the horse. There is, in fact nothing connected with agriculture, directly or remotely, that this department in France does not comprehend and include. Its policy is most broad and liberal, and its encouragement to everything calculated to advance agriculture extends beyond the confines of France, as its testimonials to citizens of other nations abundantly show. Although it is an expensive department of the government in comparison with those of other countries, the return in the production and agricultural wealth of the country far exceeds that of any other, and constitutes the great strength and power of the French nation.

A review of the progress of agricultural economy in this country brings out strikingly the fact that, as in the development of her silk and sugar beet industries, so in all other branches of her agriculture—a full appreciation of science and scientific methods is at the bottom of success.

Let us now, with these illustrations before us, glance at the past and present working of our own Department of Agriculture. Starting in 1839, as a Division of the Patent Office, with an appropriation of $1,000 for the purpose of collecting and distributing seeds, prosecuting investigations and procuring statistics, it continued with this connection till 1862. Up to 1854 the annual appropriation had not reached $6,000 in any one year; yet the reports published under the auspices of the Patent Office, up to that time, are valuable and creditable, considering the means and facilities for work then at command. By 1854 the work of the Patent Office had so stimulated agricultural enterprise that Congress that year appropriated the sum of $35,000, and the present organization of the department was fairly instituted. The annual reports from this time till 1862, when a separate Department of Agriculture was established, were most creditable, and the discussions and experiments in the reports prior to this time, on tea culture, corn-stalk sugar, etc., and the negative results that have come from them, are well worth pondering, in the light of recent sanguine claims for those proposed industries! The history of the department since that day is familiar to all, and, if popular verdict be a just criterion, the working of the institution has, for the most part, been disappointing. In the words of Senator A. S. Paddock, of Nebraska: "This department, as at present organized, is a disgrace to our agriculture, and a reproach to the country. Hitherto in the popular estimation it has had no status except such as it has made for itself through its partial and unsatisfactory distribution of seeds, in answer to demands based rather upon political considerations than the exact interests of agriculture. * * * Appropriations have been freely made for seeds, while scientific investigations in the interests of agriculture have, as a rule, been scoffed at, and, if not entirely ignored, they have been neglected by Congress."

To enumerate the many directions in which it has failed to keep abreast with the times—the golden opportunities for increased usefulness which it has lost—would extend my remarks beyond all reasonable limits and weary you. Suffice it to say, whether in the statistical, horticultural, chemical, botanical, entomological, or microscopical divisions, its work has been inferior to that in the same line by many private associations and State institutions, and has sometimes been of such a character as to seriously reflect upon the department. It has too often exhibited a want of knowledge of what other countries have done in special fields, and shown contempt for really scientific work.

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A study of its past history and a year's insight into its present workings, have confirmed me in an opinion which, with others, I have long held, that there is need of a radical change in its character. The farming community has so far had no voice in the appointment of the man who is to represent it. Either personal or political influence has governed. Agriculture is non-sectional, non-political, and the department should be, as far as possible, independent of politics. Competent representative men at its head must needs be the exception, so long as political hydraulics must be brought to bear to obtain the appointment.

There are no regents or trustees to watch over the Commissioner's management of affairs; no councils, such as the other heads of departments find in cabinet meetings. The Department of Agriculture is, in fact, an autocracy. It has no vital connection with the different State organizations having similar ends in view. The salaries of the divisional heads, as also that of the Commissioner, are insufficient to attract first-class talent.

We want a thorough system of statistics and crop reports; not indefinite ones, gathered from a few voluntary correspondents and mailed to the farmer weeks, and perhaps months, after they have become stale and valueless; but gathered by numerous trained observers, paid for their work, and wired every few days over the country and announced through the daily press—not from our own country alone, but from other countries. In ordinary business the seller puts the price upon his wares, but with agricultural products the case is reversed, and the seller is at the mercy of the buyer. With timely crop returns from other countries, the farmer would have more to say in this important matter. By co-operating with the Signal Bureau, this could be easily and inexpensively done.

We want permanent divisions of Veterinary Science, and perhaps of Forestry. We want increased efficiency in all the present divisions of the department. Their heads are now paid as second or third rate clerks, and, indeed, are not unfrequently looked upon as such, having no more voice in the working of the department. They should be men so eminent in their several specialties that they would form a national Advisory Board, with which the Commissioner would be glad to counsel, and to which the country could look for advice and for the most authoritative opinions on all questions in any way connected with agriculture. They should form a tribunal or national commission competent, and with sufficient power and means, to carry on investigations for the solution of any problem that may arise, such as the prevention and cure of diseases of animals and plants; the suppression of insect enemies; the thorough test of new products, etc., etc.

The faculties of the different State Agricultural Colleges should be made subsidiary to these national professors, so as to give aid when required, if there is any possible way of bringing that end about.

With each of the department divisions fully equipped and supported in this manner, there will be no further need of the various special offices and commissions that it has been found necessary to create, under present conditions, to perform work legitimately belonging to the Department of Agriculture, and there would, in fact, be a real saving of expense to the Government. * * * * * * * *

In the light of the past history of the German experimental stations and their work, or of that in our own State of Connecticut, the expediency of purchasing an experimental farm of large dimensions in the vicinity of Washington, is very questionable. There can be no doubt, however, of the value of a good experimental station there, that shall have its branches in every State of the Union. The results to flow from such stations will not depend upon the number of acres at command, and it will be far wiser and more economical for the Commissioner to make each agricultural college that accepted the Government endowment auxiliary to the National Bureau, so

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that the experimental farm that is now, or should be, connected with each of these institutions, might be at its service and under the general management of the superintendent of the main station. There is reason to believe that the directors of these colleges would cheerfully have them constituted as experimental stations under the direction of the department, and thus help to make it really national—the head of a vast system that should ramify through all parts of the land.

It is repeatedly urged that our Government is niggardly in respect of agriculture. The charge is certainly not warranted: for, while there has been an unfortunate disposition in Congress to make light of the department, there is a due and proper appreciation of the importance of agriculture, as of all other industrial pursuits, and I am satisfied that there would be no difficulty in obtaining munificent Congressional support for a department that should, by its working, earn the respect of the people at large. The liberal land grants made for the establishment of agricultural colleges, and the large edition of 300,000 copies of the agricultural report that is ordered, abundantly testify to the readiness to help on the part of Congress; while the development, under Congressional aid, of the Signal Bureau, and of the Fish Commission, both of which should really have emanated from the department, attests its liberal spirit. Government encouragement is more needed in a new country like our own than in the more settled countries of Europe, and twenty times the present appropriation to the department would not be extravagant were it efficiently organized on a broader basis.

With the different State Agricultural Colleges, and the State Agricultural Societies, or Boards, we have every advantage for building up a National Bureau of Agriculture worthy of the country and its vast productive interests, and on a thoroughly economical basis, such as that of Prussia, for instance.

In studying how this improvement can best be brought about, I have become more and more satisfied that we need a national body that shall be representative, and at the same time have jurisdiction over the department; and I am, therefore, in favor of some such bill as that which has already been introduced by Mr. Fort, of Illinois, to establish a National Board of Agriculture. It was read twice at the last session of Congress, and is now before the House Committee on Agriculture. There are fourteen sections in the bill, and its principal features are, that the board shall consist of one member from each State or Territory, to be appointed by the President upon nomination of the State Board or Society, or, upon recommendation of the Governor, where no such board or society exists. The Commissioner of Agriculture shall be a member of said board, and have the same vote and privileges as the other members, except as to mileage and per diem pay. The board shall meet once a year, on the second Monday in January, in the department building, to consult and deliberate as to the best means of promoting the interests of agriculture and increasing its productions. The board is given power to investigate the operations of the department, and to make recommendations to Congress concerning the same. By or before the third Monday of February each year, the Commissioner is required to lay before said board a full and detailed statement of the operations of the department in the past year, including expenditures; also to carry out the suggestions of the National Board as to the operations of the following year.

With a stepping-stone like this, there would be some hope of the reorganization and improvement of the department in the lines I have indicated. Three principal objects would be attained by such a National Board. It would serve, 1st, to bring the department into more intimate connection with the different State organizations created for similar objects, and thus secure for it greater efficiency, popularity and support. 2d. It would relieve the Commissioner from much responsibility. 3d. And in my judgment, most important of all, it would serve to secure the appointment of rep-

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resentative men. For the President would doubtless be glad of its opinion expressed by resolution, or otherwise, as to the fitness of any man it might indicate.

The House Committee on Agriculture is now considering the question of making the Commissioner a Cabinet officer; but the efficiency of the department will not be increased by simply adding to the position and dignity of its head, without likewise reorganizing it as a whole. Whether or not agriculture should have a voice in the cabinet counsels any more than other of our great industries, is a matter of opinion; but there can be no question about reorganization. The Bureau should either be enlarged in the direction I have indicated with a supervisory board, or merged into a Department of Industry to be represented in the Cabinet, something after the plan proposed by Senator Windom, of Minnesota, in a bill introduced two years since, or after the plan of the French Government. At present it is an anomaly. There is much to be said in favor of elevating and broadening the scope of the department so that it shall be represented in the Cabinet by a Secretary who, with all the other Cabinet officers, will be expected to change with each administration; but the assistant secretary, who should occupy a similar position to the assistant secretaries in other departments, would, like them, be apt to remain from one administration to another, so that the retention of administrative experience would be insured, which is not the case at present.

The question I would ask, gentlemen, in concluding, is: In how far, and in what way, can a body such as you have just organized, help to bring about the needed reform? In other words, what is to be the scope and sphere of the organization? The failure of the United States Agricultural Society, and the languishing condition of the National Agricultural Congress, seem to indicate that there is no field for a national agricultural society, so-called, unless it tread in a different path. Those bodies organized with as much enthusiasm and promise of success as this one has, and I have watched and studied with interest, the progress, or rather retrogression, of the last named, since its meeting in St. Louis in 1872, which was honored by the presence of distinguished men like the late Commodore Maury, and which gave every promise of usefulness. Those societies undertook to do that which the vast extent and the diversified climate and products of our country render impracticable. For men who will put their hands in their own pockets and travel thousands of miles for the object of discussing the advancement of the general agricultural public, are few and far between. The Royal Agricultural Society of England, which you would pattern after, owes its success, as we have seen, to conditions that do not obtain in America. Annual fairs of a national character that shall exhibit the products of a country so vast as ours, are essentially impracticable; while you cannot expect to do so well the special work performed by other existing national organizations, as of pomologists, nurserymen, grape-growers, stock-breeders, wool-growers, dairymen, poultrymen, bee-keepers, etc. Nor can you expect, it seems to me, to do effectually the work of gathering statistics, making returns, and the other routine work for which the State Societies have been organized and the Government Bureau was created. In what direction ought we then to labor? There are three principal means by which we can build up a powerful, influential, and independent organization. These are by meetings for the discussion of subjects of national importance; by encouraging original and scientific observations and researches, either by supporting committees specially appointed therefor, or by the offer of prizes for the best essay on the subject it is desired to investigate; and, lastly, by the publication of a journal of proceedings and special memoirs. The society can most succeed in advancing agriculture, and will be most likely to make its influence felt in bringing about needed reforms, by the publication of well digested reports and memoirs than by any other means, provided it admits only the

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best and most meritorious essays and papers, and excludes, through the medium of a competent publishing committee, everything of indifferent value.

We must bear constantly in mind that the press is the great power of the day, and that science is the hand-maid of successful agriculture.

> But words are things, and a small drop of ink
> Falling, like dew, upon a thought produces
> That which makes thousands, perhaps millions, think.—BYRON.

Let us endeavor and determine to do our utmost to make the work of the Society creditable and effectual in promoting the objects for which it has been conceived; to make it a power in the land for the good and advancement of agriculture; to encourage the membership of the purest and ablest men, and keep in the background all who have selfish objects to promote. By so doing, only, can we hope to steer clear of the rocks on which our predecessors have foundered; to earn the respect and support of earnest men throughout the length and breadth of our land; to influence Congress in wise legislation respecting agriculture; to help produce, in the words of good King Brobdignag to Lemuel Gulliver, "two blades of grass to grow where only one grew before."

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THE DAIRY—ITS PROFITS AND PROSPECTS.

LECTURE

Delivered at the Organization of the American Agricultural Association, December, 1879.

BY

HON. X. A. WILLARD,

OF LITTLE FALLS, NEW YORK.

MR. PRESIDENT AND GENTLEMEN :—

I have been invited to make a few remarks to-day upon the dairy—an industry that has grown into vast proportions in several States, and is constantly increasing its dimensions.

It has, perhaps, made more rapid progress of late than any branch of agriculture that can be named. It embraces a wide range of labor, requiring great diversity in the exercise of skill and intellect. First, knowledge as to the nature of milk and its treatment in various relations; its manufacture into many different products and their care and preservation, and back of this the great arts of breeding; the management of dairy cattle both in health and disease; the production of their food, and all the details concerning the best use to which special feeding crops may be put. These it is important to understand to insure the largest success. There is no farm industry that has been so well organized. The co-operative factories extend in an almost unbroken line from Maine to California; they can scarcely number less to-day than 5,000, each factory sweeping a circle of influence on a radius of from two to three miles, and through which many thousands of dairymen are held by strong pecuniary bonds.

I cannot better illustrate the magnitude of the associated system than by referring to its operation in the State of New York. In 1874 New York had 1,139 of these co-operative factories, at which more than 23,000 farmers were delivering the milk of 308,352 cows. As the factories of New York have been considerably increased since 1874, it is estimated that at least 30,000 farmers and 30,000 farms are now identified with this interest. By having a complete list of factories every co-operative dairyman could be reached in a few days through the factory managers.

The dairy conventions, which, for sixteen years, have had remarkable sway, are an outgrowth of the co-operative system. These have stimulated inquiry and a desire for improvement, which may be said to mark a new era in this branch of industry. The discussions and experiments of dairymen have so sharpened the intellect that there is now no class of men so critical, so exacting, or who can weigh a speaker's words with more precision, than those who gather at these conventions. Mere eloquence is of little avail with these men unless it be crowded with stubborn facts and suggestions that may at once be applied to business and turned to good account. They have carried the co-operative system into the marketing of their products, and now Dairy Boards of Trade are established in the chief centres of the interior, where prices for goods are manipulated with a shrewdness gathered from a knowledge of

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values in the markets of the world. At Little Falls more than 25,000,000 pounds of cheese from the factories annually change hands. At the Utica Board as much more.

We have at the International Dairy fair a fit representation of this vast industry—an exhibition, both in magnitude and excellence, never before equalled. it represents not only the goods but the appliances which have revolutionized the business and placed American dairying in the front rank among the nations of the world. Here also may be found the great merchants identified with its commerce—liberal and enterprising—who are at the wheels of the produce trade, moving and distributing over the world American dairy goods to the value of hundreds of millions of dollars. In discussing matters pertaining to the dairy, not the least important question to be considered is its profits and future prospects.

For the last twenty years, or up to 1879, dairying of all kinds has been very remunerative; in fact, so uniform have been its profits that the gains could be calculated with great accuracy and certainty months in advance of the crop. We had a foreign market for all our surplus; our goods were wanted at fair prices by one of the wealthiest nations on the globe. England imports annually of butter and cheese to the value of $75,000,000. English merchants assured us they could dispose of an unlimited quantity of our cheese at fair prices, providing it had plenty of quality; and so we sailed on in fancied security.

Near the close of 1878, however, it became evident that the American surplus, together with the English production, had reached the limits of ordinary consumption. It may be well to more clearly define this in figures: The annual consumption of cheese in England, as stated by Morton and other statisticians, is 504,000,000 pounds; the British make has been estimated at 312,000,000, and is now, according to Prof. Sheldon, 282,000,000, leaving 222,000,000 pounds as the annual amount required to fill the English demand for free consumption.

Now, let us see how nearly this has been reached. For the year ending Dec. 31, 1878, our cheese exports, the largest ever made, amounted to 134,000,000 pounds, while the Canadian exports during the same time were about 42,000,000 pounds. The import of cheese into England from Holland, and other countries on the Continent, as stated by Sheldon, is not far from 64,000,000 pounds, and these three items foot up 240,000,000 pounds, or 18,000,000 pounds more than is ordinarily required in Britain.

* * * * * * * * *

I am not sure that the real prosperity of American dairying is at present to be promoted by high prices. Low prices mean the reduction of the make in England, and an outlet for an increased exportation from America. If we can lay down American cheese of fine quality in London or Liverpool below the cost of English production, cheese dairying there must be abandoned, and in that event there will be room for an increased export from America of 282,000,000 pounds to supply the demand of her markets. It may seem hard for us to urge this point against our brother dairymen across the water, but in the end it must come to that. We must either arrest the spread of our cheese-making interest or find new markets, or press out English productions. But even should cheese-making be abandoned in the States, Canada and Australia would, in a short time, occupy the ground now held by us, and the wiping out of English dairying would only be a little delayed. I do not see how it is possible to maintain high prices under an increased production.

I know there are many dairymen in the Eastern and Middle States who complain that no money has been made in dairying at last Summer's prices, and they doubtless speak the truth from a standpoint of their own experience, but I cannot believe that it is necessarily so. It is a humiliating thing to acknowledge, and yet is a fact susceptible of proof, that the mass of dairymen have not improved the milking qualities of their herds during a long period of high prices, but on the other hand they have al-

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lowed their herds to depreciate in this particular by using refuse cattle from droves, rather than in breeding stock on the farm. When cheese brings 15 to 20 cents per pound, and butter from 40 to 50 cents, cows that yield 300 pounds of cheese or 100 pounds of butter per year are supposed to turn some profit, but when prices fall to this year's rates it is found that these inferior herds do not pay expenses.

Now, this is the condition of things largely prevailing in the East, and the whole system must be changed or the poor cow dairyman will be obliged to drop out of the business or go to the wall. But if we assume that a herd can be made to yield 600 pounds of cheese or 300 pounds of butter per cow, cheese at 7 cents and butter at 20 cents have not so discouraging a look; 300 pounds of butter at 20 cents is 60 dollars; 100 pounds at 50 cents but 50 dollars. I can remember when men bought farms and paid for them and laid up money by selling cheese at 6 cents and butter at 15 cents per pound. Perhaps it can not be so well done now, even with the help of our improved labor-saving machinery, for our wants are larger and there is less economy. But I do not think dairymen need feel discouraged at prospects in the future. Butter and cheese will always be needed, and if prices are lower than in the past, a way must be devised to meet the situation. We must remember also that means are constantly being discovered to cheapen the production of food, and this is in accordance with the designs of a higher than human power; not for the purpose of benefiting solely the producing class, but that the world's poor may receive their share of the blessing in cheap food.

As an indication pointing in this direction, the tide of immigration flowing into the Red River country of the British North American Possessions may be cited. An uninterrupted development of this rich wheat-growing section, should it continue, but for a single decade in the same ratio for the past two years, would add, it is estimated, 100,000,000 bushels to the wheat product of the globe. This quantity is about equal to the present annual importation of grain into Great Britain, from all sources; and the question may well occur whether we shall not see, in a few years, a wheat production greatly in excess of the present rate of consumption.

The immense herds of cattle at the West, and the development of agriculture in new territory, plainly indicate cheap food in the near future, and the new discoveries and new processes will, without doubt, make the average profit on the crop nearly equal to that obtained now.

The system of Ensilage for preserving green fodder by packing in silos; the new milking machine; the centrifuge and other inventions, for extracting cream from milk immediately after being drawn from the cow, all promise the means of cheapening the production of butter and cheese very considerably, while hundreds of other new devices on the farm and in dairy appliance must lessen labor and elevate dairying to a rank little dreamed of a few years ago.

Our cheese-makers have made some mistakes in the past—in devoting all their energies to one style of product—in looking forward too exclusively to a foreign market, and neglecting home wants.

That we have a home market, the best in the world, is shown in the enormous consumption of butter. Our annual butter product has been variously estimated at from 1,000,000,000 to 1,400,000,000 of pounds, nearly the whole of which is consumed at home. Had the proper styles and qualities of cheese been put upon the home markets, our people would have become so educated in its use that nearly the whole make, it is believed, would now be required for home consumption. We need now to introduce a greater variety of goods, varieties that are esteemed as delicious—notably the Stilton, Neufchatel and the soft French cheeses, with many other sorts suitable to the tastes of people coming from all the different nations of Europe. The plan so much in vogue of sending all the best goods abroad, and retaining the poorer sorts for our

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own population, does not promote consumption at home. There is no reason why we should not be large consumers of cheese, and this desirable object could surely be brought about, did our dairymen take half the pains to cater to home wants that they do to suit the export trade. The home trade in the many luxuries of the dairy opens up a wide and prosperous field for dairy husbandry in the future.

In conclusion, the opinion may be confidently expressed that no branch of agriculture stands upon a more substantial basis than the dairy. It has the elements of success and prosperity—it must prove remunerating and enduring. It is endowed with vast capital; it has clearly inaugurated a system for the instruction of the people, by which the principles of science, mechanism, political economy, and the laws of trade are to be learned by the farmers of the country. It is to-day a tremendous power in the land, working for the progress of the whole country, and it is destined to sweep along with irresistible force.

And now, Mr. President, as a last word, I desire to express my conviction that the time is favorable for the inauguration of a National Agricultural Society.

The importance of Agricultural societies in general, and of Industrial Fairs, cannot be overestimated. Since their introduction, lands are better tilled, manure more economically applied, better implements used, and larger crops obtained. And I am clearly of the opinion that a National Society suited to the spirit of the age can be made a successful institution—an institution calculated by its example, no less than by its labors, to unite the farmers of this vast domain and encourage them onward in the path of progress and improvement.

No country on earth contains such natural resources as belong to the United States. These resources should not only be developed and the fruits distributed to the full extent of our own wants, but a foreign demand should be created, and the whole world be made acquainted with American products and enjoy the fruits of American industry.

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PRODUCTIVE INDUSTRY THE SOURCE OF NATIONAL WEALTH.

A PAPER PREPARED BY

DR. THOMAS P. JANES,

OF PENFIELD, GA.,

For the First Convention of the American Agricultural Association, December, 1879.

GENTLEMEN OF THE AMERICAN AGRICULTURAL ASSOCIATION:—

It seems peculiarly appropriate that the representatives of the great industrial and productive interests of such a country as we possess—so vast in extent, so varied and rich in its resources, and having such vast susceptibilities of further and endless development, should meet in council to discuss questions both of local and general interest, that they may learn to appreciate each other's difficulties and advantages growing out of peculiar surroundings, to impart and receive information upon subjects relating to these great interests, to discuss questions of general interest to producers as well as consumers in this vast Republic, and by greater familiarity with the wants of all classes to establish between the producers from all sections of the Union a community of feeling based upon the strong ties of community of interest. It is peculiarly appropriate that those engaged in furthering the interests of intelligent, progressive, profitable agriculture should assemble in this Empire State, the mother of true and successful co-operation, illustrated by her numerous creameries, the home of the father of drainage in this country, the home, too, of the Allens, the Thurbers, of Barry, of Elwanger, of Downing, of Harris, of Moore, and a host of others whose names are inseparably associated in the minds of the American people with the most advanced husbandry in all its branches of agriculture, horticulture and stock-raising, which they have illustrated by their practice and illuminated by their writings.

Meeting, as we do, under such influences, surrounded by evidences of thrift and comfort resulting from the application of science to productive industry, we are impressed with the fact that

PRODUCTIVE INDUSTRIES FORM THE BASIS OF NATIONAL WEALTH.

Reviewing the history of the nations of the earth, we find that the development of the productive industries, agriculture, mining, manufactures and mechanics, has invariably been the forerunner of civilization, prosperity and national greatness. Where these have been neglected, or where the productive classes have been oppressed or unjustly discriminated against, civilization and national prosperity have declined just in proportion to the neglect of these interests.

We are in the habit of speaking of classic Greece and Rome, and associating them with literature, war, and the fine arts, but when we look to the basis of their rapid rise in greatness and power, we find that "if the Greeks were pre-eminently a nation of poets and artists, they were no less pre-eminently a nation of farmers." "The Greek mind absorbed beauty as the Greek body took in health and wholeness (another

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word for holiness) from the earth it loved. The love of rural life was one of the deepest passions of the Grecian heart, beyond the realm of Arcadia real or ideal. Through the whole compass of Greek literature—the sights and sounds of the country—the murmuring of the bees, the rising sun smiting the earth with his shafts, the rich meadows, the cattle feeding in the pastures, furnish images upon which the city poets delight to dwell." "The plains of Attica were covered with rural homes, the country was full of little sanctuaries for the rural deities, nymphs, and others who frequented them." In the Greek classics we not only find how much they knew of agriculture, but how little we have improved upon their knowledge.

"They knew the virtues of guano, fish and sea-mud in the cornfield, that land recovered its strength by lying fallow."

Xenophon advised the turning under of green crops even if they had to be planted for that purpose. Indeed it is humiliating to the boasted pride of civilization of the nineteenth century, when we learn from the Greek and Roman authors how little progress has been made in the knowledge of man in relation to agriculture during the last two thousand years.

"The richest agricultural and horticultural contributions have come down to us from the master minds of Greece. They drew their inspiration directly from nature herself, and not from what some earlier writer had said about nature."

The pupil of Socrates, the leader of the immortal retreat of the ten thousand, from his farm at Elis, wrote: "Agriculture, for an honorable and high-minded man, is the best of occupations and arts by which men procure a living; for it is a pursuit that is most easy to learn and most pleasant to practice; it puts the bodies of men in the fairest and most vigorous condition, and is far from giving such constant occupation to their minds as to prevent them from attending to the interests of their friends and their country. A man's home and fireside are the sweetest of all possessions." So long as Greece gave proper attention to her productive interests, and especially to agriculture, her star stood at the zenith, but as luxury increased labor was degraded, education diverted from a practical to a speculative course, and agriculture became subordinated to trade and commerce, the star of her glory gradually sank to the horizon from which it has never again risen.

The policy of Rome was to "secure to the plowshare what she won by the sword." Twice was Cincinnatus called from the plow to save his country, and not until effeminacy and luxury supplanted the rural tastes and habits of the people was she overrun by the hordes of the North.

Did time allow we might run through the whole catalogue of nations that are or have been powerful upon the earth, and show that in proportion as they dignified labor and fostered their productive industries they have been great, powerful and stable. Read the histories of these nations and we find that the development of their productive industries either by just laws or the fostering care of their governments has marked the era of their progress, prosperity and highest civilization. The accumulation of capital in the hands of a few, by trade and commerce, and the oppression or neglect of the productive industries, equally marks the era of their decline and overthrow.

We live in an age of progress unequalled in the annals of the past in the rapidity with which the powers of nature are being subordinated to the use of man.

American genius has contributed more than that of any other people to this wonderful progress in the useful inventions. By the invention of steam, coal has been called upon to do the work which required thousands of men to perform before. The Continent is netted over with iron rails upon which the locomotive speeds with its

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freighted trains until the maps of some of our States, seem, as it were, armed with a coat of mail.

The chained lightning has been taught to transmit with the rapidity of thought the human voice. When we contemplate the rapidity with which invention treads upon the heel of invention, we grow dizzy with the thought, and involuntarily ask what next?

What are the inevitable consequences of these immense strides in inventive skill? What their effects upon our civilization? What upon the habits, thoughts and wants of man?

They create a restless activity in the minds of men, increase their wants, induce a disposition on the part of the young to leave the quiet retreats of rural life for the bustle and excitement of the marts of trade—to withdraw from the productive industries and crowd to overflowing the profession, trade and commerce. The means of rapid communication and transportation increase the power of capital to control the products of industry and oppress the producer.

The capitalist sits in his office on Wall street and dictates the prices of corn and wheat at Chicago, and of cotton at New Orleans. He bears the price upon the producer and bulls it upon the manufacturer until both become tenants-at-will, laboring for his emolument. We are following in the footsteps of Greece and Rome, and unless those engaged in the productive industries of our country keep pace with the progress of the age, maintain their dignity, increase their productive power in proportion as the wants of man multiply, and by education and co-operation assert and exercise their rights as citizens, it may happen, within the next century, that capital will dictate laws to Congress and install presidents at will.

The vital question for us to consider is: How can the industrial interests of the country be organized so as to best promote their production and such increased development as will enable them to keep pace with the progress of the age? How can those engaged in the productive industries be reached to excite in them an interest in the practical education of their youth and in organized co-operation for the furtherance of their own interests? Can these ends be accomplished by voluntary organization, or will it require the fostering care of the Government—State and Federal?

If the latter, would any means adopted by the said Governments be amenable to the charge of class legislation, or would it be of such a nature that all citizens would be either directly or indirectly interested and benefited? We will devote a few moments to the discussion of these questions, and throw out a few suggestions for the consideration of this body.

Much can be done through the agency of voluntary organizations, local, State and National, but these alone cannot so well accomplish the work demanded by the best interests of our whole people, as they can as auxiliaries to State and Federal Departments, when the information collected through these and other sources can be, as it were, focalized and crystalized under official sanction, and again reflected forth throughout the whole extent of our country to enlighten, encourage and stimulate the toiling millions engaged in feeding and clothing the world. Isolated as producers must necessarily be, in a country so vast as ours, organization is almost impossible and concerted action impracticable without central heads and media of communication, such as State and Federal Departments afford. The Department at Washington, during the present and previous administrations, has paralyzed its strongest arm by failure to recognize and utilize for the general good the work of local and State Societies, and State Boards and Departments.

I hold that all citizens are either directly or indirectly interested in the promotion of the industrial protective interests of the country or State in which they live, and that legislation which fosters these, either by protective laws or the appropriation of

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the public money to increase their efficiency, enures to the good of the whole people and is not amenable to the objection that it is class legislation.

A State is nothing more than the embodiment of the aggregation of individual interests and should be so administered as not only to protect its citizens in the enjoyment of their natural and constitutional rights, but should foster those industries from which its own life-blood flows into its coffers. None will deny that however magnificent the superstructure of an edifice may be, it cannot withstand the storms of time unless the foundation is strongly laid.

So long as Greece and Rome built upon the solid foundation of their productive industries, they increased in influence, wealth and power; but with their neglect came decline, and with their oppression downfall.

Let us take warning from the lessons of history, and cherish those industries which furnish the life-blood of individual, State, and National prosperity.

Let our statesmen look more to the sources of national wealth, to the basis of national greatness, and to the conservative productive element of our population—upon which not only the stability of our peculiar political institutions rests, but upon whose labor man depends for food and raiment, and governments for their revenue, and less to the perpetuation of political parties—and we may look for greater prosperity and less strife, universal employment and no strikes.

The agricultural classes—the owners of the soil—have in all time and in all countries constituted, together with the mechanical and manufacturing interests, not only the sources of national wealth but of national stability. The very slowness with which they grasp and embrace new ideas, while obstructive to progress in their business as producers, constitutes them the most conservative element as citizens.

Believing, then, that the productive industries are the very corner-stone of our material prosperity and political stability, it behooves us, as a people, to foster these interests in such a manner that the foundation upon which our grand superstructure of national prosperity rests shall maintain its stability and due proportion to the superstructure.

We have a Department of Agriculture at Washington, established and sustained by the Federal Government, for the purpose of learning and supplying the wants of the productive interests of the Union. How far the objects for which this Department was established have thus far been subserved, I will not discuss, but will have the presumption to suggest what should be the mission of this Department to more fully realize the expectations of those for whose benefit it was established. We would not join those who doubt the utility of such an establishment, because it has not accomplished what was reasonably to have been expected from its work, but would rather unite with the friends of progress to sustain it and increase its usefulness.

What should be the mission of this Department? How can its efficiency be increased? These are appropriate questions for discussion by this body of representative men from the different States and Territories of this great republic. I will make a few suggestions and leave the matter for the consideration of this body.

In the first place, the appropriations should be increased to an amount adequate to the thorough performance of the great work demanded by the productive industries of the Union, and commensurate with the magnitude of the interests involved.

The total amount appropriated by the United States Government during its existence is only $3,216,114.37.

On this subject Commissioner Le Duc in his report for 1877 says: "The utter insignificance of this sum becomes apparent when compared with the amounts appropriated for the maintainance of other departments of the General Government. Dividing the total amount appropriated by the number of years during which these appropriations have been made and it gives the small sum of $84,634 as the average

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annual expenses of the Department. When it is remembered that the last census establishes the fact that one-half of the population of the United States is either directly engaged in agricultural pursuits, or is wholly dependent upon them for support, this sum becomes still more insignificant as an appropriation for fostering and promoting so vast an interest."

The following appropriations for the years named will be sufficient to illustrate the difference in the amounts appropriated for the various departments of the general government:

Departments.	1877.	1878.
Department of State	$1,188,797 50	$1,147,660 48
Treasury Department	14,837,357 47	12,784,718 94
War Department	7,337,675 02	1,983,902 73
Military Establishments	29,651,769 86	———
Navy Department	388,588 24	365,966 67
Naval Establishments	12,789,790 90	14,536,432 90
Department of Interior	3,418,432 89	3,450,627 14
Indian Affairs	5,147,897 63	4,877,990 00
P. O. Department	567,860 29	936,549 20
Postal Service	5,917,498 00	2,939,725 00
Department of Justice	385,876 20	412,622 05
Department of Agriculture	174,686 96	208,640 00

By consolidating the appropriations to the War and Navy Departments, Military and Naval Establishments, we find that the United States Government appropriated in 1877 $50,117,824.02 to defense, while during the same year it appropriated only $174,686.96 to the encouragement of production, or 286 times as much for defense as to production.

I do not say that too much is appropriated to defense, but that too little is done to encourage, increase and develop the productive industries of the country.

Not less than $1,000,000 should be devoted by the General Government to the encouragement of the productive interests of the whole country, and as the proportions of these interests expand the appropriation should be increased.

The Department of Agriculture at Washington should place itself into close communication with all auxiliary organizations, National, State and local, and stimulate as far as possible not only the activity and usefulness of such organizations, but encourage the formation of new ones in every State and county.

To aid the Commissioner in the discharge of his duties there should be a secretary from each State who is familiar with the character of the soil, climate and productions, and the needs of the producers of his State. These secretaries, all acting under the general supervision and direction of the Commissioner, and actively co-operating with him and with each other, could give an intelligent and efficient direction to the work of the Department which we have not recognized in the past. Such an arrangement would diffuse and localize the interest in the work of the Department and vastly extend its influence and usefulness. It would give each State, as it were, a personal interest in the work and induce inquiry and contributions now never thought of. It would give such State a direct representation and consequently a voice and a direct *interest* in the working of the Department. It would afford facilities for collecting and disseminating information not now at the command of the commissioner. It would enable the Commissioner to make a more wise and judicious distribution of seeds and the publications of the Department. It would contribute to the elevation of the Department to that position of dignity and influence which the importance of the interests which it represents demands.

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Gentlemen, upon the elevation of agriculture, and its cognate productive industries, depends not only the prosperity of the country but the stability of the government.

Hon. H. G. Davis said in his place in the Senate of the United States last January:

"From the time of the landing at Jamestown and Plymouth Rock, the American farmers have always constituted the advance guard and the largest part of that grand army of progress and liberty which, in its triumphant march in the face of dangers, trials, privations, and the cruelty of the savage, has gradually subdued forests, crossed rivers and climbed mountains, until civilization, society, churches, schools and happy homes have been established from ocean to ocean, and from the lakes to the gulf.

"The American farmers have laid the foundation of an empire on this continent, destined, largely through their efforts, virtues, industry, courage and devotion to free government, to surpass in substantial glory, grandeur, wealth, progress and prosperity, all the nations of this world and the achievements of history.

"Our liberties were conquered and our Constitution made mainly by farmers, and to them, in any and every great crisis, we must look for the safekeeping and protection of both. As a rule the agricultural classes have always been devoted to liberty, peace and good order, and the friends of established society, and the enemies of disorder, wrong, change, violence and unjust revolution; they constitute the reserve forces of conservatism in all governments, particularly in ours.

"The collection of large populations in commercial centres, by depleting the country, has a dangerous tendency. It is in the cities and these great centres, that rings, strikes, frauds, trades unions, centralization, and consolidation, are born, fostered and best flourish, while in the agricultural districts the tendency is in the opposite direction."

Washington, in a letter to Sir John Sinclair, said:—

"I know of no pursuit in which more real and important service can be rendered to any country than by improving its agriculture and its breed of useful animals."

General Jackson, in his fourth annual message to Congress (December, 1832), says:—

"The wealth and strength of a country are its population, and the best part of the population are the cultivators of the soil. Independent farmers are everywhere the basis of society and the true friends of liberty."

Washington, in his eighth message to Congress, said:—

"It is not to be doubted that with reference either to individual or national welfare, agriculture is of primary importance. In proportion as nations advance in population and other circumstances of maturity, this truth becomes more apparent, and renders the cultivation of the soil more an object of public patronage. Institutions for promoting it grow up, supported by the public purse; and to what object can it be dedicated with greater propriety?"

The most prosperous nations of the earth foster agriculture by appropriations of money from the public treasury, and find it a productive investment.

The following amounts were expended by some of the governments of Europe in aid of agriculture in the year 1877. I invite a comparison of these amounts with the sum appropriated by the United States:—

Austria and Hungary	$5,495,125
France for Agriculture and Commerce	20,534,410
Prussia	2,612,340
Italy for Agriculture and Commerce	2,715,995
Russia for Agriculture and Public Lands	14,826,184
Great Britain	795,590
Sweden	651,737
United States	174,686

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"The little Kingdom of Sweden, with twenty-one times less area and almost one-twelfth the population of the United States, appropriates more than three times as much to the protection and promotion of her productive interests as the United States. This little kingdom with a little more than half the area of Texas, and with a population less than that of the State of New York, does more to foster production than this great agricultural nation does.

Russia, itself a great agricultural nation, with less than twice the population, and a little more than twice the area of the United States, devotes to the support of agriculture and her public lands more than *seventy* times as much as the United States, while France, with an area of only 210,830 square miles, appropriates to agriculture and commerce more than twenty and a half millions annually.

The time has come when the intelligent producers of this country should demand at the hands of their representatives the substantial recognition of the fact that the productive industries form the basis of national wealth, by extending to them fostering protection, support and encouragement commensurate with their importance.

There is much that can and should be done by individual and voluntary co-operative enterprise, but there is important work that must be done to foster and extend the producing capacity of these industries which can only be done by governmental agencies, laboring in harmony and conjunction with individual and co-operative enterprise.

With all of these agencies properly adjusted, liberally supported, and wisely directed, who, without prophetic vision, can adequately paint the future of this grand Republic?

Judging from the progress of the last century in the development of the productive industries of this country, who can picture, even in his imagination, the grand proportions which productive powers of this Republic may attain within the next century, under the influence of such liberal and enlightened policy as we have shown is pursued by the most advanced nations of Europe, or the grand superstructure of civilization, the natural outgrowth from such a foundation.

Gentlemen, the hope of this country rests in the education of the people and the development of the material resources with which the God of Nature has blessed us more abundantly than any other people upon the globe. Let us wisely use the heritage thus given us for the advancement of civilization, the perpetuity of the liberties bequeathed us by our fathers and for the glory of Him who gave.

Thomas P. Janes.

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ON INCREASING THE FERTILITY OF PASTURES.

BY

J. B. LAWES, LL.D., F.R.S.,

ROTHAMSTED, ST. ALBANS, ENGLAND.

The report of the Department of Agriculture for 1875 shows that in the State of New York the number of acres under crops is returned as a little below seven and three-quarter millions; and that on more than four millions of the total acreage crops of hay are grown. In the transactions of the New York State Agricultural Society of a few years before this date, I find that the improved land amounted to nearly fifteen million acres. The term "*permanent pasture*," as far as I know, never appears in the United States reports; still it would appear probable that a very considerable area of ground in the State of New York must be under permanent pasture.

In the neighborhood of cities or large towns it is found more profitable to keep the land in pasture; and hay, dairy products, vegetables and fruit usually take the place of grain crops, for this reason, that the former give a much larger money-value return per acre than the latter.

Owing to the complicated character of the herbage of a pasture, and also the extremely different uses to which it may be applied, a simple treatment of the subject on which I am about to write is almost impossible. I will give an example by way of illustration. A great many years ago, a very remarkable improvement of some pasture land, in one of our northern counties, was obtained by the application of a large dressing of bones. The land had been always employed in the production of cheese, for which this county was celebrated. This success induced others to use bones, and people whose land had been impoverished by the continued sale of hay could not understand why the bones, in their case, produced no effect, not distinguishing the difference in the character of the exhaustion of the soil due to the sale of cheese, as compared with that which took place by the constant removal of hay.

Before entering upon any remarks respecting the influence of manures upon the produce of grass, it will be necessary to notice its general character and composition.

An ordinary pasture is made up of a variety of plants, belonging to different botanical species, which we generally classify under three heads, although the third, called miscellaneous, or weeds, belongs to a variety of orders.

The general composition will be found in the following table:

	Nitrogen, per cent.	Mineral Matter, per cent.
Gramineous Herbage	1.17	5.9
Leguminous Herbage	2.32	6.8
Miscellaneous Herbage	1.32	8.7

Hay being a mixture of these different classes of plants, must necessarily vary a good deal in composition; but it may be considered to contain, on the average, 1.3 per cent. of nitrogen and 7 per cent. of mineral matter. In treating of the application of manures, I shall assume that carbon, hydrogen and oxygen are derived from the atmosphere, and the mineral matter and nitrogen from the soil. This would be equivalent to nearly 92 in each 100 parts of dry hay being derived from the atmosphere and 8 from the soil.

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I am quite aware that in making the soil the source of the nitrogen in plants I am liable to be misunderstood; I will, therefore, briefly state the views which I hold in regard to the subject.

I believe that the atmosphere is the original source of the nitrogen in plants; that the very large amount which we find in our soils has been stored up by natural vegetation, such as forests, pastures, &c. The nitrogen thus obtained is one of the main elements of the soil's fertility, and is derived from atmospheric sources by the accumulation of ages.

On the Rothamsted pasture, which has been under experiment for the last 25 years, the nitrogen upon the permanently unmanured land amounts to 8,000 pounds per acre within the first 15 inches from the surface. It is this large amount of nitrogen which enables us to increase very considerably our hay crops by means of mineral manures alone. Still, we obtain a much larger increase when nitrogen is added to the minerals. If we consider that the permanently unmanured land has produced 2,000 pounds of hay per acre; that land liberally supplied with all the necessary minerals produces 3,000 pounds per acre, and that the addition to these minerals of nitrogen in some soluble form, such as nitrate of soda or salts of ammonia, produces a crop of 6,000 pounds of hay to the acre, it almost appears that, if we could command temperature and moisture, there would be hardly any limit to the possible growth, provided that nitrogen and minerals were present in the soil in sufficient abundance.

It is evident that the source of the carbon must be the atmosphere and not the soil, as no ordinary soil contains the amount of carbon which would be fixed in the plant under the assumed conditions.

There is one point of great practical importance in regard to the employment of artificial nitrogen, to which I will here refer—viz., that its application is always attended with more or less loss; and, in consequence, it does not perform all the work which it otherwise might do. Throughout the whole of the Rothamsted experiments the amount of nitrogen recovered in the increased produce has always been very much less than the amount applied in the manure. This is a subject of very great importance to the United States farmers, and I would recommend it to their consideration. Artificial nitrogen, in all its forms, is a very costly substance; and although it might be profitable to employ it, provided that it did all the work which was possible, still the difference between the possible and the actual result might turn the profit into a loss—while unfortunately the amount of nitrogen which may be lost is dependent upon such a variety of contingencies that it is impossible to lay down any rule on the subject.

A crop of corn, wheat, oats, barley, as carted from the field—I refer to the total produce—contains about one per cent. of nitrogen; by adding nitrogen to a mineral manure, we can more than double the produce given by the application of mineral manures alone; but if the whole of the nitrogen applied as a manure could be recovered in the crop, the result would be that each pound of nitrogen would produce 100 lbs. increase in the crop. Let us assume that a crop of wheat, fully supplied with mineral manures, yields 12 bushels per acre, and that double that crop is wanted: 12 bushels at 61 lbs. to the bushel give 732 lbs. of grain, and estimating 100 lbs. of straw to each 61 lbs. of grain, the amount altogether is 1,932 lbs., containing 19 lbs. of nitrogen. Now, 100 lbs. of sulphate of ammonia, or 140 lbs. of nitrate of soda, ought to produce this increase, but we find that it does not, as our results appear to show a loss of about one-half of the nitrogen applied; whatever the loss may ultimately prove to be, the fact that a loss will occur must not be lost sight of in dealing with so costly a substance.

I have stated that in 2,000 lbs. of hay there are 26 lbs. of nitrogen: now, it is perfectly certain that the application of 100 lbs. of sulphate of ammonia, containing about 20 lbs. of nitrogen, will not increase the hay by 1,540 lbs. In dealing with manures contain-

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ing nitrogen, the atmospheric supply of nitrogen to the crops is no longer in question, as the soil and atmosphere are presumed to have furnished all they could, and that a larger yield is required. The following table gives a summary of the results obtained over a period of 20 years—showing the produce per acre of hay on an average of the first 10 years, on the second 10 years, and the total period of 20 years. The full detail of these experiments, so far as regards the agricultural portion, have already appeared in the Philosophical Transactions of our Royal Society—the botanical and chemical portion we hope to publish during this and the coming years. Those who wish to go more fully into this very complicated subject, I must refer to these papers; all I can undertake to do at present, is to point out some of the most prominent features in the results:

EXPERIMENTS WITH DIFFERENT MANURES ON PERMANENT MEADOW LAND.

The land has probably been laid down with grass for some centuries. No fresh seed has been artificially sown within the last 40 years certainly; nor is there record of any having been sown since the grass was first laid down. The experiments commenced in 1856, at which time the character of the herbage appeared uniform over all the plots. Excepting as explained in the table and in the foot-notes, the same description of manure has been applied year after year to the same plot. (Area under experiment, about 7 acres.)

Plots.	Manure, per Acre, per Annum.	Produce of Hay per Acre, 20 Years. 1856—1875. First Period. Lbs.	Second Period. Lbs.	Total Periods Lbs.	Duration of Periods. Years.		
1	1856–63, 8 years, 14 tons Farmyard Manure, and 200 lbs. Ammonia-salts*; 1864 and since, 200 lbs. Ammonia-salts alone	5,538	4,348	4,824	8	12	20
2	1856–63, 8 years, 14 tons Farmyard Manure; 1864 and since, unmanured	4,804	3,682	4,131	8	12	20
3	Unmanured, continuously	2,531	2,226	2,383	10	10	20
4 (1)	3½ cwts. Superphosphate of Lime†	2,732	2,384	2,527	7	10	17
4 (2)	3½ cwts. Superphosphate of Lime, and 400 lbs. Ammonia-salts	4,440	3,414	3,837	7	10	17
5	400 lbs. Ammonia-salts	3,420	2,471	2,946	10	10	20
‡6	1856–68, 13 years, 400 lbs. Ammonia-salts; 1869 and since, 300 lbs. Sulph. Potass, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos.	3,425	3,502	3,452	13	7	20
7	300 lbs. Sulphate Potass, 100 lbs.§ Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	3,797	4,118	3,958	10	10	20
‡8	1856–61, 6 years, 300 lbs. Sulph. Potass, 200 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia, and 3½ cwts. Superphosphate; 1862 and since, 250 lbs.‖ Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	4,027	3,098	3,377	6	14	20
9	300 lbs. Sulphate Potass, 100 lbs.§ Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwt. Superphosphate, and 400 lbs. Ammonia-salts	6,002	5,421	5,711	10	10	20
‡10	1856–61, 6 years, 300 lbs. Sulph. Potass, 200 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosphate, 400 lbs. Ammonia-salts; 1862 and since, 250 lbs.‖ Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos., 400 lbs. Amm.-salts.	6,223	4,725	5,647	6	14	20
11 (1)	300 lbs. Sulph. Potass, 100 lbs.§ Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosph., 800 lbs. **Ammonia-salts	6,913	6,006	6,459	10	10	20
11 (2)	300 lbs. Sulph. Potass, 100 lbs.§ Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosph., 800 lbs. **Ammonia-salts, and 400 lbs. Silicate Soda ††	7,077	6,909	6,993	10	10	20
12	Unmanured continuously	2,808	2,564	2,686	10	10	20
13	300 lbs. Sulph. Potass, 100 lbs.§ Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosph., 400 lbs. Ammonia-salts, 2,000 lbs. Cut Wheat-straw	6,185	6,678	6,432	10	10	20
14	550 lbs. Nitrate of Soda ‡‡, 300 lbs. Sulphate Potass., 100 lbs. § Sulphate of Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	5,944	6,777	6,406	8	10	18
15	550 lbs. Nitrate of Soda	4,088	3,913	3,968	8	10	18
16	275 lbs. Nitrate of Soda, 300 lbs. Sulphate Potass, 100 lbs.§ Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	5,058	5,382	5,210	8	10	18
17	275 lbs. Nitrate of Soda	3,887	3,755	3,791	8	10	18
18	Mixture supplying the quantity of Potass, Soda, Lime, Magnesia, Phosphoric Acid, Silica and Nitrogen contained in 1 ton of Hay (commencing 1865)	3,908	3,301	3,604	5½	5½	11
19	275 lbs. Nitrate of Soda, 290 lbs. Sulphate of Potass, and 3½ cwts Superphosphate (commencing 1872)	....	....	4,318	4	..	..
20	327 lbs. Nitrate of Potass and 3½ cwts. Superphosphate (commencing 1872)	....	...	4,092	4	..	..

* "Ammonia-salts" in all cases equal parts Sulphate and Muriate of Ammonia of Commerce.——† The "Superphosphate of Lime" is, in all cases, made from 200 lbs. Bone-ash, 150 lbs. Sulphuric Acid Sp. gr. 1·7 (and water).——‡ Plots 6, 8 and 10 had, besides the Manures specified, 2,000 lbs. Sawdust per acre per annum for the first 7 years, 1856–1862, but without effect.——§ 200 lbs. 1856–1863 inclusive.——‖ 500 lbs. in 1862 and 1863.——** Only 400 lbs. in 1859–60–61.——†† The application of Silicates did not commence until 1862.——‡‡ 550 lbs. Nitrate of Soda is reckoned to contain the same amount of Nitrogen as 400 lbs. of "Ammonia-salts."

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It will be observed that of the two unmanured acres, No. 3 and No. 12, one always gives rather more produce than the other, the average produce of one over the whole period of 20 years being 2,383 lbs., and of the other 2,686 pounds; for reasons which we have fully gone into in the original paper, we have considered it advisable to adopt the produce of Plot 3 instead of the mean of 3 and 12 as our standard of unmanured produce; but both show a decline in the second 10 years as compared with the first. Experiment 2 received 14 tons of ordinary yard manure annually for the first 8 years of the period, in all 112 tons per acre; but since the first 8 years it has received no manure. During the 8 years of the application of the dung, the increase of hay obtained on Plot 2 over the unmanured land was 2,139 pounds of hay per acre, and for the next six years after the application of the dung had ceased, the increase was much the same, being 2,147 pounds per acre; since then the produce has gradually declined, but even at the present time—17 years after the last application of dung—the produce is still several hundred pounds more than that of the unmanured land; and compared with the constituents contained in the dung, there is still a very large amount to be accounted for which has not been taken off by the increased produce.

In the two experiments 5 and 15 we have equal quantities of nitrogen supplied to the grass every year; in one the nitrogen is in the form of ammonia combined with sulphuric and hydrochloric acid; in the other it is in the form of nitric acid combined with soda. The ammonia experiment commenced two years earlier than the other, but in 1858—when the first application of the nitrate took place—the hay produced in the two experiments was nearly equal; since then the produce under the ammonia salts has rapidly declined, until it is now very little above that of the unmanured produce, while upon the experiment receiving the nitrate, the produce of the last 10 years, as compared with the first 8 years, has been the same.

This great superiority of the hay producing properties of the nitrate over the ammonia—equal to about 1,000 lbs. of hay per acre annually over the whole period—is due partly to the superior power of the nitrate to liberate and render available the stores of the soil; and partly to the supply of soda which it yields to the plant.

The property possessed by growing vegetation of using soda where there is a deficiency of potash in the soil, is very clearly established in several of these experiments, and will be alluded to when we write upon the chemistry of the subject.

The superiority of nitrate over ammonia is equally apparent when all the necessary minerals are employed in conjunction with these two substances, as is the case in Experiments 9 and 14. During the first period, which includes 10 years with ammonia and only 8 years with nitrate, the average produce is almost exactly even in the two experiments, being 6,000 lbs. of hay per acre annually. In the same period of 10 years, the produce of the ammonia plot had fallen from 6,000 lbs. to 5,421 lbs.; while the nitrate had risen to 6,777 lbs., thus again showing the superiority of the nitrate over the ammonia.

In Experiments 11 and 12, where much larger quantities of ammonia are used with the minerals, we have the largest growth of hay produced on any of the plots—the average in one case is close upon 7,000 lbs. of hay per acre; and even this does not show the full effect of the manure, for since 1874 we have been taking two crops of hay annually, and the produce has amounted on the average to 10,000 lbs.; and in 1877 it reached the amount of 12,344 lbs. of hay per acre. Of this great weight of produce the soil has contributed about 8 or 9 per cent., and the remainder comes from the atmosphere.

In Plot 7 we have an experiment in which, from the commencement, no manure containing nitrogen has been placed upon the land; a very liberal supply of potash, soda, magnesia and phosphate of lime has been applied every year, and the average produce of the 20 years has been close upon 4,000 lbs. of hay per acre. It may

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be noticed also that the produce of the last 10 years is rather the highest. Compared with the unmanured land, the produce upon Plot 7 is a little over 1,500 lbs., but it is nearly 1,800 lbs. below the increase given by the minerals combined with ammonia, and 2,448 lbs. below the minerals combined with the nitrate, annually.

In Experiment 18, which has only been carried on 11 years, up to 1875, we supply the exact quantity of minerals and nitrogen, which we estimate to be taken out of the soil by one ton of hay. It is not easy to find any basis for comparison in this case, as the fertility of the unmanured land had already been reduced by the removal of 9 crops. If, however, we take the produce of the last 10 years of the unmanured land for comparison, we find that we have only obtained 1,453 lbs. by materials which were competent to furnish 2,240 lbs. of hay; this is about two-thirds of what we should have obtained if all the manure had been taken up. The nitrogen contained in the increased produce amounts to 15 lbs., which is nearly one-half of that supplied in the manure. It may be mentioned also that there was a considerable decline in produce in the last 10 years of the unmanured land, which we took for the basis of comparison.

I have now pointed out some of the most prominent of the experiments, and will conclude this part of the subject with a few remarks on the practical knowledge which may be derived from them.

In the remarks which I have made up to this point, I have purposely abstained from saying anything about the difference of the quality of the herbage produced by the different manures; as this point will be more appropriately treated when I have done with hay as an article of sale.

Whatever may be the case in New York, in Great Britain the value of hay depends upon its being of a good color, and got in without any injury from rain, than from any difference in its feeding qualities. Hay is sold in the London market by the load of 18 trusses, weighing 56 lbs. each; this is as nearly as possible the United States ton of 2,000 lbs. The price of a load of meadow hay is from $20 to $25, which does not differ much from the New York quotation of $1 to $1.25 per 100 lbs.

The price of the most important ingredients in manures would not, I conclude, differ very much in the two localities. With regard to the effect produced by manures here and in the State of New York, possibly we may lose more of the soluble portion of our manures by drainage, while in New York, want of sufficient rain, combined with a higher temperature, may prevent the crop from making use of all the elements of plant food which are readily available.

Let us now endeavor to estimate the cost of the the hay grown by the manures applied. In Plot 18 the exact ingredients contained in one ton of hay are applied as a manure. And as these ingredients are not specified in the table of manures, I will give them here:

Chloride of Potash..... ..	76 lbs.	38 lbs. Potash. 7 lbs. Soda. 36.7 Chlorine.
Sulphate Magnesia.....	35 lbs.	5.6 Magnesia. 11.1 Sulphuric acid.
Bone Ash.....	26 lbs.	11. Lime. 8.2 Phosphoric acid.
Sulphuric Acid.....	26 lbs.	
Silicate Soda	50	31 lbs. Silica.
Silicate Lime..... ...	50	
Salts of Ammonia	164 lbs.	34 Nitrogen. 90.6 Chlorine and Sulphuric Acid.

It is somewhat difficult to estimate the cost of this manure, but I do not think it could be bought and sown upon the land for much less than $16; with a produce of 1,453 lbs. of hay there would be little or no profit.

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Plot 7.—The manures used in this experiment could be probably bought and spread upon the land at a cost of from $12 to $13; the increased produce amounts to 1,500 lbs. of hay; there would, therefore, be a small profit upon this transaction. But it must be remembered that the success of a purely mineral manure depends upon the amount of nitrogen liberated from the store in the soil; and in the course of time this store will be reduced by the process of exhaustion to the same level as that which we now have in our arable land.

Plot 14 received the same minerals as Plot 7, but with the addition of 550 pounds of nitrate of soda, which, when placed upon the land, would probably cost about $20; this, added to the cost of the manure of Plot 7, would amount to $32 or $33 per acre. The increase of hay obtained by these manures was 4,000 lbs. It must, however, be observed that I have made no charge for the cost of labor attending the cutting and converting this increased produce into hay; I might also add that I have taken, as the basis for comparison, the lowest in produce of the two unmanured acres.

During the whole period of 20 years the 112 English or 125½ United States tons of dung had produced 35,000 lbs. of increased produce of hay, which is equivalent to a produce of about 280 lbs. of hay to each ton of dung of 2,000 lbs.; but the crops of the last six years prove that the efficacy of the dung is by no means yet exhausted. It is not in my power to place a value upon dung, as the cost turns entirely upon the carriage. I live 25 miles from London, and my farm is one mile from a station. The cost of dung by rail is 60 cents per English ton; delivery on my land costs an additional 42 cents—making altogether $1.02.

The result of these experiments make it somewhat doubtful whether hay can be grown profitably by means of artificial manures applied to permanent pasture. With us hay is generally grown near large towns, and the same conveyance which takes it to market brings back the manure at little or no cost.

Compared with its selling price, hay removes more of the soil constituents from the land than most of our other salable products. One hundred pounds of hay will remove nearly as much nitrogen and much more mineral matter than 100 lbs. of wheat. These considerations must all be studied when the question comes as to the profitable application of expensive manures. While therefore the evidence is somewhat against the use of artificial manures when hay is grown for sale, it by no means forbids their employment when grass land is used for the production of meat, milk, butter, or cheese; and to illustrate this I will merely allude to one manure ingredient, viz.: potash. In the large crop of hay which we take from Plot 11, we carry off annually 140 lbs. of potash per acre; 1,000 lbs. live weight of an ox or sheep contains about 1½ to 1¾ lbs. of potash. There are very few acres of land in the State of New York which will fatten one bullock per acre, and even if there were, the potash carried off would not amount to more than one pound. Of milk, 100 lbs. weight contains a little over ½ a lb. of mineral matter, or about one-thirteenth part of what would be contained in 100 lbs. of hay, while butter robs the land of nothing.

If land has been impoverished by the sale of hay, and hay is to be sold, dung is the cheapest manure to apply; but if land so impoverished is intended for the future to produce milk, meat, or other animal products, potash is sure to be wanting, and the best manure to apply will be either 200 lbs. of sulphate or muriate of potash, or three times that quantity of kanit salts, and, in addition to whichever of these substances is selected, 200 lbs. of superphosphate of lime and from 60 to 80 lbs. of nitrate of soda.

If, however, the land has been impoverished merely by feeding stock, then the exhaustion will be more likely due to the absence of nitrogen and phosphate, and fertility must be restored by an application of these substances as manures.

I mentioned in a previous part of my paper that quantity, rather than quality, was the object to be attained when hay was the crop grown; but when animal products are

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produced from grass, the quality of the grass is of very great importance. Quality of pasture is dependent upon the food in the soil: in land under grass there is a constant struggle going on between the various plants which constitute what we call a pasture. Upon my experimental ground, the pasture contained about 50 different species of plants when the experiments were commenced, and upon the unmanured ground these have been subject to but little change; but it is far otherwise upon the variously manured portions; if the food is abundant and good, the good grasses drive away all the weeds and bad grasses, and the ultimate result is a very simple herbage, consisting of not more than from 15 to 18 of the best species. The constant mowing, although it enables us to establish a great deal of valuable information respecting growth, is, at the same time, most destructive to the finer sorts of herbage; it cannot be expected, for instance, that much white clover will be found amongst grasses standing three feet high, and yielding 7,000 lbs. of hay to the acre: with liberal manuring, therefore, there must be close feeding, and the coarse but highly nutritious cocksfoot and foxtail must not be allowed to smother the clover and trefoil.

Having once started a permanent pasture by means of a judicious mixture of artificial manures, the question arises whether it is more economical to keep up the fertility by a fresh application of artificial manures, or by the manure obtained by feeding stock upon the land with food grown in other localities? It is not easy to decide this point. I am myself inclined to think that the latter process is the most economical, and, in the conversion of arable into pasture land—upon which operation I have been engaged for the last ten years—I have trusted to the fertilizing properties of the manure from cotton cake to enable me to accumulate the stock of fertility which, being exhausted by ages of arable culture, had to be replaced before the land could again become a pasture.

When hay, which is the produce of arable land, is grown for sale, it is by no means certain that the increase, obtained by the application of artificial manures, would repay the cost of the operation. Nitrate of soda at the rate of 100 lbs. per acre, applied in the Spring, about a month before the crop began to grow actively, would probably give a considerable increase to a crop of timothy, but I cannot venture to give an opinion as to what would be the pecuniary result of the transaction.

Sunlight is cheaper than all artificial sources of light, and natural fertility is cheaper than any artificial compound; in the absence of sunlight we have recourse to purchased light; and as the natural fertility is exhausted from our soils we are driven to use fertility derived from other sources.

It is the object of science to investigate and explain the laws which regulate the growth of plants, rather than to enter upon the question of economy. In the present paper I have endeavored to unite, to a certain extent, science with practice, in the hope that the farmers of the United States, who take the trouble to read what I have said, may add something to their present stock of knowledge.

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AGRICULTURAL SURVEYS.

BY

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Among the many matters interesting to the agricultural population, which, until quite recently, have received but passing attention on the part of Government, is the accurate, intelligent and intelligible description of the agricultural features of the several portions of the United States. In nearly all the States geological surveys have been carried on for a greater or less period, and in most of the acts creating these surveys an examination and description of agricultural features is specially provided for. But in many cases this provision has remained a dead letter; in all but a few no such thing as a general description of the agricultural features of a State, such as would be wanted and understood by the intending settler, has been attempted, and even the detailed description of counties, from which such a general idea might be somewhat laboriously compiled, often give the distinctive agricultural peculiarities rather casual than direct mention. When the description of soils is attempted, such vapid generalities as "a loam mixed with sand and clay" reappear with a discouraging persistency; and the entire tenor shows too frequently that among the corps of observers in a State not one was sufficiently acquainted with the details of scientific agriculture to describe intelligently what he saw, or should have seen, of the agricultural features.

The difficulty of procuring competent teachers, combining scientific and practical agriculture, for the agricultural colleges created by the "Morrill Act," is but another symptom of the same remarkable fact, viz.: that, in a country where agriculture is the overwhelmingly predominant industry, scarcely a beginning has been made in the education of a class of men who shall be to the farming community what the mining expert is to the mining industry—men who are capable of understanding both the scientific and practical bearings of what they see, with mind and senses specially trained in that particular direction. The agricultural expert, the "agronomist" of Europe, but trained with reference to American ideas, needs and practice, is, as yet, such a rare bird that he is practically unavailable when wanted. And this is doubtless one of the chief causes of the scarcity of thorough work bearing on agricultural practice in our public surveys.

But whatever may be the cause, the fact is a lamentable one, and in a country where immigration and "moving" are such prominent features it is doubly to be regretted. For want of the information that should be accessible to every one interested, through cheap publications of a thoroughly impartial character, individuals, and even whole colonies, are inveigled into settling in districts of which only the highly colored reports of interested parties have reached them, and which, on inspection, they find thoroughly unsuited to their wants, intentions and tastes. Often the experience thus gained has to be paid for by weary years of hard and unlooked-for toil in uncongenial pursuits and climates, and the wreck in fortune and health of hundreds who never would have dreamt of locating where they found themselves at the end of their journey if a true

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statement of the facts had been accessible to them. There are few regions of the United States that do not suit the tastes and circumstances of some one of the widely diverse nations that flock to these shores; but why should the Norwegian waste his substance in trying to suit himself in the cotton region, or the seeker for a mild climate be deceived into seeking it in the extreme continental one of the Northwestern States? Yet this happens continually even now, and has happened ever since Godfrey Duden first drew his fancy pictures of the tropical delights of Missouri and Illinois, and led thousands of confiding souls to seek that earthly paradise with utterly false expectations, making for himself rather a sorry, and in some respects undeserved, reputation for deliberate deception.

The knowledge of the geological structure of a country is in any case highly important, and must of necessity be one of the first steps in carrying out a State survey. This requires the close study of rocks and fossils, and that of economically important mineral products is based upon the knowledge thus obtained; but why stop short there, and give only a passing glance to those transcendently important formations—the soils upon which the very existence of the population depends? Why not outline them as carefully, and study them as thoroughly and patiently as the ambitious palæontologist does his fossils when in search of a new species to be named, or of a new geological subdivision to be established? Why not study them at least as closely as the mining expert does his ores, before determining upon the most economical mode of treating them?

The reply to this question, which I have often asked, is usually something to the effect that the study of soils is tiresome—does not pay—and that nobody thanks you for it.

Of these three excuses, the last one is perhaps the one having most foundation in fact; witness the slight attention, the severe criticism, in place of commendation, bestowed upon the efforts of the distinguished pioneer in this matter, Dr. David Dale Owen, who in his surveys of Kentucky and Arkansas for the first time made the systematic study of soils, as well as their analysis, a cognate and equal branch of his work, the early demise of that acute and patient observer preventing him from giving his observations on the soils of the two States mentioned; the discussion which was needed to render them fruitful has until now left the record in a dormant condition, awaiting an interpreter. Dr. Owen held that a knowledge of the chemical composition of soils is a condition precedent of an understanding of their faults, merits and ultimate permanent value, and that by a comparison of the chemical data with the results of cultivation under the ordinary, natural circumstances, a better insight into the laws governing productiveness could be obtained than by artificial cultures on soils, or in solutions compounded for the purpose, and that the knowledge so gained would be of the most direct practical importance in determining beforehand the intrinsic value and proper treatment of the soils of the Territories yet to be settled. That in any case, as full and intelligent a report on the agricultural features of a State, as of the geological ones, was the province of the State surveys.

Fully agreeing with these views, the writer carried them out in his work in the States of Mississippi and Louisiana, and his experience there has satisfied him more and more of the correctness of Dr. Owen's position, though for many years he stood almost alone, especially as regards the matter of the utility of soil analysis. Within the last ten years a notable change has occurred in the opinion of agricultural chemists on this subject, and it now seems likely that soil analysis, modified in accordance with the latest investigations on the functions of the several ingredients, will take its place among the recognized means of obtaining a knowledge of the value and proper treatment of soils. Yet even to this day, State and National surveys are partly carried forward, with but the least possible regard to the special claims of the

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agricultural industry, upon at least the casual attention that can be bestowed in passing through a region; and while detailed attention is given to minor specialties, in which agriculture is concerned, the immigrant and settler is still left either to grope his way himself, or to rely upon the representations of interested parties.

It is hardly to be wondered at, that under these circumstances we so often find the representatives of the farming districts of a State combining to stop what to them appears a useless expense, by defeating the appropriations for the prosecution of the State surveys, often involving the most grevious loss of valuable material, accumulated at great expense, and by years of labor. It can hardly be denied that in very many cases of this kind, the State Geologists themselves deserve the greater part of the blame that justly attaches to such wanton waste, for failing to take into due consideration the predominant industry of their States.

In the work now progressing under the authority of the Census Office, involving the description and mapping out of the agricultural subdivisions of the cotton-producing States, these omissions have become curiously apparent. Observers have had to be sent out to examine over again the agricultural features of States whose geology has long been well understood, but an intelligent and practically useful description of whose agricultural features could not be gleaned from the records heretofore made. The same would be found true of most of the other States.

It is to be hoped that the example that will have been set by the publication of the agricultural reports and maps of the tenth census, will not remain without a following; and that in the conduct of State and National Surveys hereafter, a plain connected and practical exposition of the agricultural features of the States concerned will be among the first, and not the last and least, publications made; and these not only in ponderous volumes whose very aspect and weight alarm the uninitiated, but also in such shape as will render the work available for popular reading. In this as in many other respects, the agricultural interests have not thus far received the consideration to which their importance justly entitles them.

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THE RELATIONS OF FORESTRY TO AGRICULTURE.

THE WESTERN CATALPA TREE.

BY

JOHN A. WARDER, M.D.,

OF OHIO,

SENIOR VICE-PRESIDENT OF THE ASSOCIATION, PRESIDENT OF THE AMERICAN FORESTRY ASSOCIATION, &c.

The plodding farmer of our country will ask what possible relation can exist between the wild, unbroken forest and the smiling, fruitful farm. Nor is such a question at all surprising, especially from any of that large class of American farmers who have spent their lives and bestowed their strength in the laborious efforts connected with the clearing of our broad tracts of arable land. Most naturally, and in all simplicity, may one of the pioneers of our country ask such a question! These forests have been an obstruction to his progress; he has been taught to consider them hindrances to agriculture that must be removed at any cost, before he can bring into play the very first appliances of his art! Yes, truly, they are so; and yet it is equally clear to those who can look beyond the limits of the corn-field, that most important relations do exist between the so very different conditions of the earth's surface, as are seen in the forest and field. Their relations are manifold and most intimate, and the dependence of the latter upon the former becomes more and more important, and is more and more manifest, as we advance in our study of the scope of the broad field of agriculture, and we appreciate that forestry is, indeed, but a province of agronomony—and that the one is embraced by the other—of which it is a most important component part. Thus may we learn the relations of forestry to agriculture.

Let us reply to the query by asking: What were agriculture without forestry? * * * Simply, an impossibility; or, at the best, a constantly increasing struggle against difficulties and hindrances, whenever, in any extensive region the transformation of the natural woodlands into open tillage fields passes beyond a certain limit. To that point, be the ratio greater or less, according to the natural formation and surroundings, as well as the breadth of the territory in question, forests are a stern necessity, and they are an absolute requisite to our permanent success in any well regulated system of agriculture.

And why so! is it asked? * * * Because forests modify the climate; because they are the great regulators of the temperature and of the moisture of the atmosphere about us, and these are elements of necessity to our success in the management of vegetable life, for which agriculture exists.

Forests are the reservoirs and the conservators of moisture, and the sources of continued supply to the springs and streams and rivers of the continent. Without their presence, in due ratio, these essential and life-giving currents would soon suffer in their continuous flow, and would eventually disappear, leaving desolation in their track.

Mahomet was right when he uttered that forcible apothegm—"The tree is father to

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the rain," by which he meant, of course, trees in the aggregate. * * * Trees in forest masses attract, receive and retain, and then gradually diffuse, moisture. The precipitated water is thus husbanded instead of being wasted by rapidly escaping, as it must do, from a bare slope, and carrying with it the accumulations of a soil that has required ages in its preparation for our use.

The true and proper forestal conditions of the surface of all well regulated woodlands, render mountain forests the especial guardians and reservoirs of moisture, to supply the springs and streams and rivers of the world.

Locally, woods of greater or less extent exercise a most happy influence by breaking the force of the winds, and thus, in a marked degree, they modify the climate; they provide a kindly shelter to our crops and to our cattle from the rude blast, and from its chilling influence produced by the increased evaporation.

In this respect it is surprising how great benefit may be derived from single lines of trees. This is still more manifest when wider strips are planted, as shelter-belts around the farms in the broad expanses of an open country, like that of our Western prairies.

Intelligent nations who have learned to appreciate the value of forests, and who have acquired the knowledge that enables them to build up and to maintain a well-regulated system of woodlands, endeavor to keep from one-fifth to one-fourth of their superficial area covered with trees. These are best and most effective in their climatic influences when they are properly distributed, but it often happens that extensive tracts are devoted to tillage, while the forests are clustered in large masses on the crests of hills and on mountain ranges which are not adapted to farm crops.

In the brief period of our occupation, the energy of our people and the demands of our civilization have accomplished a most terrible and wasteful destruction of the beautiful forests bestowed upon our land by the bountiful hand of the Creator. Counting upon what we have considered an inexhaustible supply of woods, we have wasted them sadly—and now we have reached a point where it becomes us to halt. Moreover, it is important for us to recognize that, while clearing the land for our farms, we have also culled out the best of the trees from the remaining forest, which is thus greatly diminished in value; and already, in many places, the shrunken streams give us warning that we have approached the point of danger to the climate. Meanwhile, there has been no reparation to the woods, the destruction of the young trees caused by the browsing and tramping of cattle, and the introduction of grasses in place of the natural undergrowth, have not only destroyed all hopes of natural reproduction, but have so changed the physical conditions of the soil and atmosphere that even the trees, which have escaped our cupidity and remain in possession, are themselves suffering from the change—they are dying in large numbers, and compel us to extend our inroads upon the forest areas by their removal.

Now is the time to begin at least the *conservation* of our woodlands, and to aid them in the process of self-renewal. In this work natural forces most happily come to our assistance—the bountiful provision of nuts, acorns, and other seeds, is sown with a liberal hand, and we may count upon a full supply of young trees to maintain the succession, if we but furnish them the needful protection. Where they do not come in sufficient numbers, it is an easy matter to sow, or to plant such as may be most desired and most profitable; and we may also have to remove some of Nature's planting which are of undesirable kinds; but we must carefully exclude all animals from the woodland, which should *never* be used as a pasture-field. This is the first great axiom of Forestry.

In our beginnings of the future systematic forestry of America, we must all soon realize our ignorance of the subject; and with many of us this need of information extends even to a want of knowledge in regard to our own native trees themselves.

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On this account the present occasion is seized to offer to my fellow-countrymen, as a *contribution to our knowledge of trees*, the following history of one which, though possessed of inestimable value, has heretofore entirely escaped general notoriety.

THE WESTERN CATALPA.

INTRODUCTION.

The study and report upon this tree, as it has presented itself to his observation, has been undertaken as a labor of love by the writer of this essay. The serious investigation of its habitats was made at the request of Mr. E. E. Barney, of Dayton, Ohio, who had long been impressed by the value and durability of the timber, its adaptation to many purposes in the arts, and its easy production in forest planting.

Mr. B., after preparing a number of articles, which were printed in the *Railway Age*, collected them with correspondence from persons who were familiar with the tree, and issued a pamphlet entitled *Facts and Information in Relation to the Catalpa Tree*, which he has freely distributed, with seeds and wood samples, to all persons who manifested an interest in the subject.

Feeling anxious to continue, and if possible to extend, the usefulness of the good work he has undertaken in the cause of Forestry, the first pamphlet being exhausted, Mr. Barney determined to publish another edition, greatly enlarged, and embracing the results of the observations of himself and others over a much wider extent of country.

At his suggestion also, Mr. John C. Teas (who with his brother were the first nurserymen who introduced the plant to the public by advertisement and extensive sales) was induced to visit and explore the Western habitats of the Catalpa, and report the result of his observations over an extended region; still later Mr. Barney also induced me to set out upon a tour of observation of this tree, a task that has involved much labor and exposure, but which has brought its own reward, in the satisfaction of clearing up all questions as to the origin and identity of the plant, and in being able to present to our fellow countrymen the claims of a timber-tree which must prove of inestimable value in the future forestry of large portions of our land.

The writer of this memoir has found a growing interest in his study and observation of the tree, especially the Western form, since first his attention was directed to it by Mr. Teas in 1853. Aided by the kindness of Robert W. Steele, Esq., of Dayton, Ohio, a notice of this tree was then presented to the public in the columns of the *Western Horticultural Review* as A NEW CATALPA.*

It was soon after distinguished by a variety name (*Speciosa*) suggested by its very showy flowers.

A further study has induced the belief that this Catalpa was worthy of being erected into a species; in this opinion some eminent botanists concurred, and they have rendered their valuable assistance in diagnosing the plant.

Within a few months the writer has held an extended correspondence with gentlemen of experience and knowledge of trees in various parts of the country. From many of these he has received specimens of the fruit and seeds, by a comparison of which he has been able to draw important data for diagnosing these trees. This was suggested by his friend, Robert Douglas, Esq., of Waukegan, Ill., whose long experience and acumen in observing seed-characters has enabled him to detect marks from which we can make conclusive deductions.

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*Vide Vol. III. p. 533, August, 1853.

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In this Catalpa-quest the writer has traveled some six thousand miles for the sake of personally observing the behavior of the plant, both in cultivation and in its native haunts.

In the following pages there will be frequent occasion to refer to the two kinds of Catalpa which belong to the United States—one an Eastern and the other a Western tree.

The former is set forth as the typical plant, because it corresponds more nearly with the botanical descriptions, and was, most probably, the plant first found and described. It is the kind which has been generally planted in this country, and that which has been carried to Europe and there widely distributed, as proved by the seeds received from that country.

On account of its supposed origin—and because the botanists, Michaux and Nuttall, give the locality where they first observed the trees, unquestionably native in that State—it is alluded to as the Georgia kind; it is also frequently called the common Catalpa by those who have spoken and written upon the subject; and in Iowa, where it was killed by the climate, it is called the tender kind.

The Western kind is spoken of as the variety Speciosa, the Hardy Catalpa of the Iowa tree-planters, and it has been called the Early Blooming kind. By this last name it has been prominently brought into notice within the past two years by Mr. E. E. Barney.

TWO KINDS.—The assertion is here unhesitatingly made that we have, in the United States, two very distinct forms of the Catalpa; this will be clearly demonstrated for the benefit of those who may have observed the species from a limited standpoint, and may have drawn therefrom conclusions that will be abandoned after a more extended survey of the plants in other portions of the country.

HARDINESS.—The great difference in the hardiness of these trees, discovered by the intelligent tree-planters of Iowa, and published by Suel Foster, is a matter of vast importance to all those who are interested in sylviculture throughout a wide extent of country, stretching westward from the Mississippi and south of the Platte rivers, and along the Missouri, even to the north of the last-named stream, and, on that parallel of latitude, eastward through the States of Wisconsin, Illinois, Indiana, Ohio, and, perhaps also, in parts of Michigan. There the hardy variety has withstood, or will withstand, the severity of such winters as have proved destructive to the typical tree. The relative tenderness of the Georgia kind has, indeed, been demonstrated at so many points, and is a fact so well established, that the planting of this form can no longer be recommended, even in Kansas, where it has been winter-killed in latitude 39 degrees north

The fact is universally accepted that in many parts of the great valley of the Mississippi certain plants suffer in the winter climate which appear to be perfectly hardy in similar latitudes on the eastern slopes of the Alleghenies. By some this is attributed to the greater elevation of the lands, and their increased distance from the mild climate produced by the Gulf Stream along the coast.

EXPLANATION.—As the most disastrous consequences have been observed to occur where a cold winter follows, and is accompanied by unusual droughts, some persons have sought an explanation of the results of this concurrence in the circumstance, that if the depressions of temperature froze the soil deeply when there was not sufficient moisture to exclude the free access of air, the roots when thawing will be exposed to its agency, and under such conditions they must suffer. Whatever be the cause, it is a fact of vast importance to all tree planters and orchardists, and one fully recognized by the careful horticulturists of these Western States, that cold and dry winters are the most trying.

This fact is universally admitted, and the observation has been repeatedly made by

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such acute observers as Mr. Robt. Douglas and others in the North-West, that trees and plants, even those from high northern latitudes, often succumb under an exposure to such a combination of cold winds and drought, though accustomed, in their native habitats, to much greater depressions of temperature.

BOTANICAL AUTHORITIES.

Let us see what the botanists and arborists have to say about the Catalpa. The distinguished biographers of our American trees, the Michaux and T. Nuttall, in the *Sylva-Americana*, V l. II., p. 88, give the following account:

Bignonia Catalpa (Michaux).

Syn.—*Catalpa syringæfolia* (*Sims.*)

"In the Atlantic States the Catalpa begins to be found in the forests on the banks of the River Savannah, near Augusta, Georgia, and west of the Alleghenies on those of the Cumberland between the 35th and 36th degrees of latitude. Further south it is more common and abounds near the banks of all rivers which empty into the Mississippi, or which water the province of West Florida; said to be abundant on the Escambia or Conechu, which empties at Pensacola." * * * He considered it "remarkable that it does not exist in the lower part of the Carolinas, of Georgia, and in East Florida." * * * "Seeds thin, flat, enveloped in a long, narrow, membranous wing, terminated by a hairy tuft [at both ends]. Each seed with its wing is about an inch long, and a line and a half broad." * * * He then informs us that he had "never visited the thinly inhabited regions where it abounds," meaning perhaps the interior of the South-Eastern States. Michaux then says further, that it has "long been cultivated with success in Europe, though in the climate of Paris its young shoots sometimes suffer by the late frosts,"—still, he considers it "entitled to a distinguished place among ornamental trees." Some trees in this State that were imported from France prove to be of the typical form of the species—these were found at the nurseries of Storrs & Harrison, Painesville, Ohio. They are reported to be quite hardy in that locality, owing, probably, to the proximity of Lake Erie.

The beautiful copperplate in Michaux's work is correctly colored; the flower well represents the Eastern or common form of the plant, and the seed is also exactly characteristic of the type or species.

In his appendix to the Sylva, Vol. III., p. 77, Mr. Nuttall gives us this interesting information: "In a journey made into Georgia, Alabama, and West Florida in 1830, at Columbus, Georgia, on the banks of the Chatta-hoot-shee, I, for the first time in my life, beheld this tree, decidedly native, forming small, haggard, crooked trees, leaning fantastically over the rocky banks of the river." He does not say whether he saw it elsewhere in the South, but adds: "Around Philadelphia and other places in the Middle and warmer States it appears to be perfectly naturalised and very common, particularly in rocky and gravelly soils," &c.

These remarks about its native habitat, and the character of the soils of its adopted home, where, becoming naturalized on the hungry gravels and dry schistose soils, might possibly indicate a different constitution in this tree from that possessed by the Speciosa, which always occurs in nature upon the low bottom lands and silty soils of our Western rivers. Correspondents in Alabama say that the tree there also affects the river bottom lands.

In his *Genera of North American Plants*, published in 1818, Vol. I., p. 10, the same distinguished botanist, Thos. Nuttall, gives the following account of this tree:

"Catalpa (Jussieu).

"Bignonia Catalpa (Linnæus).

"*Catalpa cordifolia* (said also to be a native of Japan), rarely to be met with, decidedly indigenous in the United States; and appears to have been introduced by the aborigines,

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hence its name, '*Catawba*,' derived from a tribe of Indians residing on the Catawba river. In most of the habitats given by the younger Michaux, in his *Arbres forestieres*, which I have visited, it had evidently been introduced." * * * Here comes some valuable information, but no personal inspection with the keen eyes of the botanist; he was "informed by Governor Harrison of its indubitable existence in very considerable quantities on the banks of the Wabash * * * but extremely local." * * * "I have never once met it on either bank of the Ohio, the Mississippi, or the Missouri rivers, which I have ascended and descended thousands of miles." This is negative testimony only, and long ago discredited by that which is positive.

"In the warmer States it does not appear to grow with any degree of vigor." In this observation he must refer to the Georgia plants in cultivation, for up to 1818 he had never seen it wild; and he seems to have been comparing these with the glowing accounts given by General Harrison of his favorite, the native of the Wabash forests. Two distinguished botanists of Ohio have recently told me that they had each seen and admired the large Catalpas of the banks of the Wabash, without suspecting any specific difference, but attributed their fine appearance to the fertile soil on which they grew.

Dr. Brendel of Peoria, Illinois, kindly sends the following item from Nuttall's Travels into Arkansas in 1819: "At Point Pleasant, six miles below New Madrid, I saw the Catalpa in the forests apparently indigenous * * * though still contiguous to habitations."

And this, from James' account of Long's Expedition, 1823: "Several trees found at Smithland, Kentucky, on the Ohio, do not appear to be native, nor have we here or elsewhere been able to discover that the tree is indigenous in any part of the United States." He informs us that it is there called the *Petalfra*.

Dr. Brendel also cites Wangenheim, a German forester, who served in the British army during the revolutionary war, His Notes on American Trees were published in 1787, as a folio, in German [at Berlin]. Of the Catalpa, he says: "The tree is middle-sized, of rapid growth and short-lived; * * * original in Florida and Carolina; cultivated in the north toward latitude 43 degrees, where it does well, except in severe winters; below 41 degrees it has a shaft of 10 to 12 feet, then branching; diameter of stem 6 to 8 inches; it dies at 25 to 30 years. Wood light, spongy and useless." He also refers to the poisonous qualities attributed to it.

Dr. Brendel quotes the Italian traveler, Castiglioni, and his *Viaggio negli Stati Uniti* —published in 1790—who refers to the same popular prejudice, which he discredits, and says "it has medicinal properties."

The prophylactic qualities are set forth in his inaugural thesis, by Dr. Robert Holmes of Virginia, presented at the University of Pennsylvania in 1803.

He speaks of the "Bignonia Catalpa or Bignonia longissima of Jussieu," a native of Carolina and Virginia, and on the faith of Linnæus, also of Japan and the Bahamas.

Shecutt, in his "*Flora Caroliniana*," says, on the authority of Thunberg, that in Japan the leaves of the Bignonia Catalpa are used as poultices, and a decoction of the pods is given in asthma.

D. C. Shutze of West Point, Ga., says he has seen but one tree on the bank of the river, but a great many grow on the islands a few miles below. The tree is nearly 40 feet high, and from 16 to 18 inches in diameter. The fruit pod sent by him is fully 16 inches long.

J. H. Johnson of the State Institution for the Deaf, Dumb and Blind, at Talladega, Alabama, says: "The Catalpa grows here wild, and is sometimes planted as a shade tree. I think it prefers sandy bottom lands of creeks, tributaries of the Coosa river. It rarely has a straight trunk. The seeds sent are from a tree self-sown, not planted, which is 25 feet high, by 10 or 12 inches diameter."

Mr. P. J. Berckmans of the Fruitlands nurseries, Augusta, Georgia, and Col. R.

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Sims, State Auditor, of Columbia, South Carolina, have also sent fruit pods, and the seeds of all received from that region are characteristic of the species—the Eastern form. Mr. Berckmans considers it undoubtedly native, "as the trees are found in many sections, especially on the margins of streams far remote from any houses or clearings."

In Torrey's *Flora of the Northern and Middle United States*, Vol. I., p. 10, we find the following description of the introduced tree:

"Catalpa (Jussieu),

Catalpa cordifolia (Elliott)."

* * * with the following observations: "A large tree 30 or more feet high, with few large irregular branches. * * * *Habitat.*—Borders of fields and about farms."

"The Catalpa has evidently been introduced into this vicinity, as well as into most parts of the United States where it is now found." He then quotes Nuttall's remark "that it appears to have been introduced* by the aborigines in most of the *habitats* which he visited."

In his great work, "The Flora of New York, a contribution to the Natural History of the Empire State," the same distinguished author, after giving a full botanical description of the Catalpa syringæfolia (Sims), says of its habitats: "About habitations: introduced from the South and nowhere indigenous in this State."

Dr. Asa Gray of Cambridge, Mass., in his excellent manual, says: "Adventitious from the South-Western States!"

Alphonso Wood, in his Class Book of Botany thus gives its habitat: "Native in the Southern States, but cultivated in many places at the North for ornament and shade."

In the following language, Darlington, in his Agricultural Botany, p. 107, evidently alludes to the eastern form of the plant:

"Catalpa (Scopoli, Endlicher).

Catalpa bignonioides (Walter).

C. cordifolia (Duhamel).

Bignonia Catalpa (Michaux)."

After giving the botanical description, he says: "Stem 15 to 25 feet high, with irregular spreading branches, * * * corolla whitish, tinged with violet-purple, the throat spotted with purple and yellow."

"Seeds lance-oblong, about half an inch in length; apparently of two flat oval, divaricate lobes, connate at the base; with a membraneous covering which is extended at the margin, and especially at the apex; each apex terminating in a slender filamentous tuft or coma."

"Observation.—This small tree is said to be indigenous in the South and West, though it has the appearance of an introduced plant in Eastern Pennsylvania. It is not of much value, and has been cultivated chiefly as an ornamental *shade tree;* but it is rather objectionable on account of the numerous suckers from its roots." This last remark has not been verified by the recent observations; it rarely suckers.

In a later edition, 1859, edited by Prof. Geo. Thurber, this observation is added: "In the latitude of New York, the larger branches, and frequently the whole tree, are killed by a severe winter."

In the Penny Cyclopædia a writer says: "The Catalpa is frequent in the west of London, England, attaining a height of 30 feet, and that some American botanists question whether it is an actual aboriginal inhabitant. It was brought by Mark Catesby from the Carolinas and Georgia, and cultivated only for its beauty, as its timber value is unknown."

From Eli K. Price, Esq., Chairman of the Committee on Trees and Nurseries in the

* Planted.

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Fairmount Park at Philadelphia, and a devotee to sylviculture, the following facts have been very kindly furnished :

"I have been here since April, 1815, and have known the tree as common since that time. Dr. Henry Muhlenberg read a catalogue of the trees in Lancaster County before the American Philosophical Society in February, 1791, including the Catalpa, but not native to that county."

"They would naturally be brought here first, and John or William Bartram could not have failed to bring them from the Southern States before that time. There is one growing before my window, in the northwest corner of Washington Square, with a girth of eight feet, four feet above the ground. This was probably planted in the Spring of 1816."

"We have in the Fairmount Park a larger Catalpa, on the west side of the Schuylkill, now surrounded by a dense grove of its seedlings."

Dr. Darlington, in his *Flora Cestrica*, published 1837, describes the Catalpa as an introduced tree in Chester County, Pennsylvania.

In March, 1879, I measured the tree in Fairmount Park referred to by Mr. Price, and found at four feet high its girth was twelve feet five inches (12 feet 5 inches); at the ground it measured thirteen feet five inches (13 feet 5 inches). There are other trees near Philadelphia which are still larger and of great age. That near the Chew residence, famous in the revolutionary battle of Germantown, said to have been a good sized tree in 1787, measured fourteen feet (14 feet) in circumference two feet above the ground; Mr. Johnson's tree, in the same neighborhood, measured fourteen feet six inches (14 feet 6 inches) at eighteen inches above the ground.

These are exceptional cases to be sure, and the trees are very old, but low-branched and spreading, and having very short stems; they are fine old specimens of lawn trees.

In response to inquiries as to the introduction of the tree into Massachusetts, which were forwarded to Prof. C. S. Sargent, Director of the Arnold Arboretum, the following facts have been kindly furnished: "The pods are smaller than in your Western *Speciosa*, but this may be owing, in part, to the undeveloped seeds, which very rarely ripen in this climate, although the tree is hardy enough here.

"There are many old trees in this region, but when the Catalpa was first introduced into Massachusetts it would be difficult if not impossible to find out. I have seen trees about Boston which I can well believe are fully 100 years old, certainly 75 years, as the Catalpa grows very slowly in our severe climate and poor soil. I do not consider it a good tree for forest planting in New England, except, perhaps, in favored localities, like the valley of the Connecticut. On general principles, no tree is a good subject for forest planting in any climate where it will not ripen its seeds with considerable certainty."

In Loudon's comprehensive systematic work, the *Arboretum and Fruticetum Britanicum.* is a notice of the *Catalpa Syringæfolia*, which is said to be a native of North America, introduced into Britain in 1726, where it flowers in July and August, and sometimes sets its seeds. In some situations it is liable to die in some of its large branches; it furnishes a dye of cinnamon color. Among the trees in England, one at Syon is 52 feet high, with a diameter of three feet, and the branches spread 50 feet. There is one at Fulham Palace 150 years old, which is 25 feet high and two feet diameter. One has stood at Wardour Castle for 50 years, and has grown 30 feet high.

In Scotland, Loudon says, at the Glasgow Botanic Garden, it becomes almost herbaceous, and in Russia it is kept in the St. Petersburg greenhouses.

In his plate there is a good drawing of the seed of the Catalpa bignonioides, well representing the peculiar silky coma terminating each end of the membranaceous wing, and having the characters now looked upon as peculiar to the normal type of the species.

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In his Manual of the Art of Forestry, by Giovanni Carlo Siemoni, Inspector-General of the Forests of Italy, the author introduces the—

"Bignonia americana (Duhamel),
Catalpa syringæfolia (Sims),
C. bignonioides (Walter),
Kavvarra Fisagi (Kæmpfer),"

and says: "Spontaneous in Japan, Virginia and Florida; 10 to 12 meters high * * * introduced into Europe by Catesby in 1726. * * * Timber light, brittle, not adapted to polish; specific gravity 0.474."

In his catalogue of American plants, the distinguished botanist of Pennsylvania, Dr. Muhlenberg, gives five American species of Bignonia:

Bignonia Catalpa,
B. crucigera,
B. capreolata,
B. radicans,
B. cœrulea,

which have since been distributed into three different genera, as Catalpa, Tecoma and Bignonia.

Stephen Elliott, in his "Botany of the Southern States," describes the Genus CATALPA (Walter & Jussieu):

C. *cordifolia* (Duhamel),
Syn. C. syringæfolia (Pursh),
C. bignonioides (Walter),
Bignonia Catalpa (Michaux).

"The wood is said to be durable; habitat near Euhaw [Eutaw?] Creek, on margins of rivers in the middle and upper part of Carolinas and Georgia."

Mr. Pursh, in his "North American Plants," London, 1814, Vol. I., p. 10, under the heading:

Catalpa (Jussieu),
C. syringæfolia (Sims),
Bignonia Catalpa (Michaux),
Catalpa bignonioides (Walter),

gives its habitat—banks of the Ohio, Mississippi and Delaware. [The only authority for this last habitat.]

In his "Trees of America," J. Browne says it is "found as an ornamental tree in most of the cities and large towns from Louisiana to Massachusetts. * * * Introduced into Britain in 1726, * * * frequently to be met with in gardens and collections both in that country and on the continent of Europe."

"The largest in France is that at Sceaux, which, at 30 years, was 50 feet high and two feet diameter. At Vienna, Austria, in the Botanic Gardens of the University, a tree attained the height of 50 feet and a spread of 24 feet in 26 years from planting."† * * * "It is planted in the south of France and in Italy on road-sides and avenues."

In De Candolle's "Prodromus," Vol. IX., p. 220, we find a notice of the *Catalpa* bignonioides of Walter, and also of the *C. Kæmpferi*, which is considered but a dwarf variety of this species; whether native of Japan or introduced being uncertain; and mention is made of the species C. Bungei, as cultivated in the gardens of Northern China, and attaining tree size. He says it is probably native there. These species are known here as ornamental plants, and the two names last mentioned have been unfortunately confounded in the catalogues, so that it has become difficult to say which is which.

† Seeds have been received from this tree, kindly procured by Prince J. Adolf Schwarzenberg, which have all the characters of the American tree, *C. bignonioides* of Walter.

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IS THE CATALPA INDIGENOUS?

ITS MIGRATIONS—A HISTORICAL TREE.

This question has long occupied the minds of the botanists, and in the earlier part of this century it was a frequent topic of discussion among the people of intelligence in such matters. This was, no doubt, in part attributed to the fact that the C. bignonioides was then found almost exclusively about human habitations.

Its extremely local natural habitats in any of these then populous regions of our country would also convey a similar impression, negatively, by its absence from the forests. Very limited areas of the lands, where the Speciosa is now found in an unquestionable state of nature, had then been explored by intelligent observers, and even so acute an eye as that of Nuttall, in his extensive journeys, failed to detect it in the regions where it is now known to exist, where its seeds were gathered by Mr. Arthur Bryant, sen., in 1889, and where its nativity will hardly be any more questioned than that of its associates in the same forests—the Cypress, Plane, Liquid Amber, Oak, and others, which are clearly indigenous.

The tree has a sub-tropical aspect in its luxuriant growth, its broad expanse of leaf, and in its large and showy flowers, so that it might very naturally have produced the then current impression that, by some means, it had been introduced from the warmer climate of another continent. This suspicion may have received support from the fact that the botanists of that period were aware that it had some near congeners in Asia. One of the authorities above cited, the chief Italian Forester, Caballero Siemonie, refers to it as "spontaneous in Japan as well as America," and even Nuttall makes a reference to Japan as its home. In part, no doubt, this surmise grew out of the fact of the very restricted habitat of the tree in the portions of our country which were then occupied and fully explored. Even on the Atlantic slope it was not observed in a state of nature, except at a few points of the interior, although it seems very early to have been found planted about dwellings and near the Indian encampments.

It was a favorite tree with the aborigines; its softish tissues, its lightness and its durability were, no doubt, early noticed by that observant race, and as they are said to have encouraged its growth, or even planted it about their towns and lodges, the tree may in this way have been disseminated far from its original habitats.

That the aborigines did practice tree-planting appears from the very interesting *Travels* in the Southern States in 1773, published 1791, by Wm. Bartram of Philadelphia, a family name well known in connection with success in tree-planting of many species on the banks of the Schuylkill.

MIGRATIONS.

From the times of these early plantings of the tree in the South, we may venture to trace the history of the extension of the C. bignonioides over wider areas by supposing that from the settlements on the Southern Atlantic States its cultivation gradually extended northeastwardly, so that now it may be seen growing in every town along the seaboard, even to Massachusetts, and perhaps beyond, though it is by no means a thoroughly hardy plant, as some suppose.

In many places, notably about Baltimore, Maryland, and in Eastern Pennsylvania, near Philadelphia, this tree has become so completely naturalized as to spring up spontaneously from scattered reeds, self-sown, as though it were native to the soil; the same thing has been observed, to a limited extent, in parts of Ohio; and at Princeton, Illinois, where Catalpa seeds were first sown by Arthur Bryant, senior, in 1839, it is now growing spontaneously.

From the eastern horticultural centres we may easily trace the dissemination of the Catalpa, which was propagated as an ornamental tree by the nurserymen, who carried

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it westward from point to point, keeping pace with the advance of culture among the people, until, after crossing the mountains, it has spread among the prairies, has even overstepped the great river, and become a common shade tree in the streets and parks of St. Louis and other Western towns and cities. Away beyond the wide and grassy plains of Iowa another Catalpa has been planted upon the bluffs of the Missouri, at Omaha, and in other towns upon the further shore; and Catalpas are seen at the Western capitals, Lincoln, Nebraska, and Topeka, Kansas. Far out in the plains, thanks to the enteprise of the nurserymen, has it been brought into requisition, for the sake of its dense shade and beautiful flowers.

Unfortunately, in most cases, these are the nurserymen's trees, with their Eastern and Georgia parentage, and the less desirable kind of Catalpa. Even at St. Louis, within a few miles of the native habitats of the Speciosa Catalpa, few specimens of that more desirable tree can be found among the thousands that have been planted. Nor was it to be seen beside its Georgia cousin among the arboretal decorations of the beautiful campus of the State Agricultural College at Columbia, Missouri. This lack has now been supplied.

Even in the experimental tree-plantings of the Kansas Pacific Railway, so earnestly begun in 1871 by Mr. R. S. Elliott, the industrial agent of that road, the Catalpas were produced from Eastern seed; their reported failure is not surprising.

Beside the chief entrance-way to the grand State Capitol in Springfield, Illinois, stands a pert little tree of the typical Catalpa; its low branches are laden with seed-pods that seem to ask the assembled legislators and all visitors to gather them, and to aid in their further distribution throughout the State at the expense of the kind native to Illinois.

The Agricultural College at Champaign, Illinois, has planted the same variety in the experimental forest grounds that are to constitute so important a feature in the materiel for arboreal instruction in that institution; and the most extensive nurseries in the State have, perhaps, sent out thousands of Catalpa trees, of which scarcely one has been seen that was of the *Speciosa* form; and yet this more desirable tree is a native of that State, and was once abundant within her borders. So highly has it been appreciated for its enduring timber, that to-day it is impossible to purchase a thousand feet of its lumber at the sawmills, nor is it planted, except by rare accident, in the very region where it was once abundant.

But, to return to the Westward migrations of the Georgia tree: there seems to have been found at last a limit to the wanderings of this particular Catalpa. Many that were planted in Northern Ohio, Indiana, Illinois, Iowa, Nebraska and Kansas, have proved tender and have died, or are more or less crippled by severe Winters—indeed, much more than less. They are thus unfitted in all that range for economical planting as forest trees; although on account of the vigor and rapidity of the wood growth, and of the durability and value of the timber, Catalpas are admirably adapted for such purpose.

However, the tree-planters of that region are not without resource. They have accidentally discovered that there is indeed a more *Hardy Catalpa*. For this information we are indebted to the intelligent cultivators of Iowa, where the severity of the Winter of '55 and '65 furnished a thorough test, which the people of that whole region were not slow to observe and profit by. Now, to us in Ohio, it is particularly interesting and gratifying to find that Mr. Foster's trees which endured this crucial test, that is proving of such value, have been traced back to the Dayton stock of the *hardy* early blooming Speciosa.

Very many of this Western form of the Catalpa have been produced from seeds of General Harrison's trees at North Bend, Ohio. Among these are several on the lands of his neighbor and connexion, the late John Cleves Short. In 1852, some of these had attained a size sufficient to cut and hew for gate-posts. In order to subject

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the durable qualities of the timber to what he considered the severest test, that gentleman had them cut in the midst of their Summer growth, on July 2d, 1852; they were immediately dressed, and at once planted by the roadside, and he proposed to a companion that they should examine their condition in fifty years. They are still perfectly sound, 30 years planted.

The capitals of Indiana and Ohio are both ornamented with beautiful flowering shade trees of this same variety, thanks, also to the nurserymen! but these gentlemen appreciated the home-grown and native Western Catalpa, and persuaded their customers to plant them for their greater merit over the kind which had been imported from the East.

The streets of Dayton are largely planted with this beautiful tree; it is also conspicuous in the city of Terre Haute, Indiana.

We are now well assured that here is a different tree, recognized and described as a distinct species, and from a different origin.* While the enterprise of our nurserymen was supplying all demands for a beautiful flowering tree, as has been already set forth, and they were introducing the typical Catalpa of Georgia all through the land along the 40th parallel, a point was at length reached where the stranger lapped over upon the native territory of the hardy Western form, which had heretofore attracted little or no attention from the tree-planters.

A HISTORICAL TREE.

At Vincennes, Indiana, very early in the century, this plant attracted the attention of the Territorial Governor, afterwards the lamented President Harrison.

In front of the old Gubernatorial mansion, there now stands a living monument of his appreciation of the plant. A noble specimen, perhaps of his own planting, rears its head fully fifty feet, and spreads its branches to an equal extent, supported by a straight and erect shaft of about three feet diameter.

There is a legend, for which some one else may vouch, that after the doughty Indian fighter had conquered his wily foes, and brought them to terms by the desperate encounter on the Upper Wabash, the two great warriors, the red and the white, Tecumthe and Tippecanoe, sat together upon the lawn of the Governor's mansion, in a council held under the shade of this very Catalpa, and there cemented the treaty of peace from which has followed the wonderful prosperity of these great States that have been developed from the North-Western Territory of that day.

On retiring from the office he took plants to his farm at North Bend, Ohio, where the Western Catalpa is now naturalized, and where, under the wide shade of his transplanted trees, and while inhaling their dense fragrance, the retired hero was wont eloquently to descant upon the virtues and merits of the Catalpa.

REFLEX CURRENT.

Let us now see how this tree, also, has had its period of migrations; how curiously it has traveled toward the East, as well as in the more natural direction—that of human progress—*Westward.*

A feeble current of migration in the opposite direction had been set up, however, by this new rival, and the plants from the delta of the Mississippi and its tributaries had reached even as far as Dayton, Ohio, at an early period.

General William Henry Harrison, on leaving his official residence at Vincennes, Indiana, brought this valuable tree to his home on the banks of the Ohio, and took great pleasure in distributing it among his friends and neighbors. In 1825 he pressed the merits of the Catalpa upon his fellow-farmers assembled at the county fair in Carthage, Ohio, and urged making plantations of so valuable a tree.

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* Dr. George Engelman has become satisfied that it has specific characters, and has published a description of the *Catalpa speciosa*. Vide Bontanical Gazette for January 1, 1880.

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Some of the finest specimens of this species near Cincinnati are to be found in Covington, Kentucky. They were planted by General John S. Gano, and probably received from his compatriot, W. H. Harrison. Some of these trees have a girth of eleven feet two feet from the ground.

J. Griffin's Omaha Stock.—No little surprise was excited in the mind of the writer by seeing this very Catalpa growing in and about Omaha, Plattesmouth, Brownville, and otherplaces in Eastern Nebraska.

Inquiry as to its source and history showed that in their journey toward the plains the mother plants of this group had migrated by a very circuitous route. Joel T. Griffin, the pioneer of artificial grove-planters in that far-off State, says that all the Catalpas of that region have been produced from two plants which he purchased in 1844 from Mr. Bennet of Washtenaw County, Michigan, latitude 42 degrees 20 minutes, where his friend had received a single pod of seed from a visitor, who had brought it from Kentucky.* Many of Mr. Bennet's trees and their seedlings are to be seen on the grounds of the University and elsewhere in the City of Ann Arbor, Michigan—all Catalpa Speciosa, and uninjured by the climate.

Seeds or plants sent from Cincinnati are living and thriving at Falmouth, Mass., on the coast of Cape Cod, as I have learned from that earnest tree-planter, Joseph S. Fay, of Boston and Wood's Holl.

From these several foci plants of the hardy kind have been distributed. They have everywhere proved eminently satisfactory, not merely on account of their greater grace in habit and tree and beauty of blossom, but, what is of more importance to the Western tree-planter, in their endurance of the climate, where trees of the other form had miserably failed.

Litchfield's Grove.—Another instance of the introduction of the Speciosa Catalpa should be referred to before going further, because it is the largest group of this variety anywhere seen, without mixture with the normal type. John Litchfield, near New Rutland, Illinois, after settling upon a prairie farm, and realizing the need of trees, procured seed from his former home in Southwestern Indiana, from which he produced the plants of his groves. These have given unquestionable proof of the superiority of the variety, and also of its adaptation to the soils of the prairie. In spite of their being wholly neglected and exposed to the inroads of every kind of farm stock, the trees of 12 to 20 years are tall, straight, healthy, and, in a word, all that could be desired, and more than could be expected, from the treatment to which they have been subjected.

Arthur Bryant's Trees.—In the case of the Illinois groups, the history is complete. The venerable arborist, author of a practical manual on Forest trees, Arthur Bryant, Sen., of Princeton, Bureau County, planted the seed which he had plucked at New Madrid, Missouri, in 1839. It was known simply as the Catalpa, but there it stands with its progeny around it, while the Georgia trees have died. How fortunate was it that he himself had gathered those seeds, instead of purchasing either seeds or plants that had sprung from the Eastern source!

The similar happy accident of Mr. Litchfield has resulted in like good for himself and his neighbors. Neither of the two was then aware of the more hardy nature of the Western tree.

THE DAYTON GROUP.

Dr. Job Haines, an amateur nurseryman of Dayton, Ohio, long ago observed certain trees in that neighborhood that bloomed earlier and produced larger flowers than the Catalpas he was then cultivating. He gathered their seed and propagated

* In this he may be mistaken, as Mr. Hesser of Plattesmouth reports having brought his from Indiana.

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them for his customers. John C. Teas and his brother, young nurserymen of Indiana, finding this a desirable sort, procured the seed of Dr. Haines' trees and distributed the variety more widely, calling public attention to the superiority of this kind. By the year 1853, when there were many trees blooming in Dayton, the notice of the editor of the *Western Horticultural Review* was drawn to them by his friend Teas; it was described, and shortly afterwards named, on account of the showy flowers, *C. bignonioides var. Speciosa.*

ITS HISTORY COMPLEMENTED.

The earlier history and origin of the Dayton trees has been lost. All that was possible to gather in 1853 when it was hunted up by that indefatigable friend of horticulture, Mr. Robert W. Steele, has already been stated. Whence these trees had been brought, and by whom, could not then be ascertained; the original occupants of the land had gone, perhaps gone West, where they may one day be traced by some curious Catalpa hunter.

Now that we know the native habitat of the Speciosa, the conundrum of the Dayton trees may readily be solved; it becomes a simple problem in history and geography. Before the days of railways and canals there were already rivers, and these could be used for navigation. The Great Miami was at that time one of the highways for the trade of the young West, and it annually bore upon its swollen tide great flat-boats, *broad-horns* they were called, laden with agricultural products, that were thus carried down the Ohio and the Mississippi rivers to find a market. One of the adventurous traders of that day no doubt observed, gathered, and brought back, as a trophy from the wonderland of his journey, some of the strange looking "Indian Beans" of the Lower Country, and planted the seeds, as a memento of travel, at his home on the banks of his beautiful Miami. In that simple act he did a good work for his country, and, like many another before him, "he builded better than he knew." Or, possibly, he may have received a portion of the stock introduced into Ohio by General Harrison in 1825.

Would that the last resting place of that unknown emigrant from the Miami could be discovered! A fitting memorial for that simple act of tree-planting were to drop a seed of his own beautiful-flowering *Speciosa Catalpa* into the hillock of his grave to mark the spot and commemorate the worthy deed.

To his planting of this tree and to the appreciative observation of Dr. Haines, and to the untiring efforts of Mr. E. E. Barney, the world is now indebted for our present knowledge of this most valuable plant.

At the last moment, and just as this memorial is going to the press, information has been received as to the history of those two examples of this tree which stand upon the lawn of W. S. Little, Esq., of the Commercial Nurseries, Rochester, New York, in N. latitude 43.8 degrees.

Since their specific character has been detected, the source whence these trees were procured has been a subject of much inquiry. It is perfectly clear that they could not have been brought from the Eastern nurseries, where none of this species are now to be seen, and where the *bignonioides* alone was cultivated.

The age of Mr. Little's trees is not too great for them to have been distributed by General Harrison; they are believed to be about fifty years old. Mr. Little has kindly corresponded with members of the family of Judge Bates, the former owner, and with others, from whom he has learned that these trees were planted by Miss Bates, the Judge's daughter.

Mr. George Ellwanger of Mount Hope Nurseries has been familiar with these old trees since visiting Judge Bates, forty-five years ago; from that time he has propagated from their seed, and has some trees of pretty good size in one of the beautifully shaded streets traversing their extensive nurseries.

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Rochester is further north than the usual range of the *Catalpa bignonioides*, and the continued existence of trees of that species must be attributed to the proximity of Lake Ontario modifying the climate.

HARDINESS OF THE WESTERN FORM.

SUEL FOSTER'S OBSERVATIONS—JOSEPH S. FAY'S STATEMENT—IS CATALPA SPECIOSA A SPECIES.

The time when the Speciosa was first described there was no question, in this part of the country, as to the hardiness of Catalpas. In that respect all were ranked with the typical form, and while close observers noticed their tropical aspect, and had heard the rumors as to their exotic origin, the trees were supposed to be capable of withstanding the climate up to latitude 40 degrees north, or even 41 degrees in the Ohio Valley. As already stated, the test of an Iowa winter awaited them, however, and in the terrible and memorable season of 1855 and 1856, on the grounds of Suel Foster, on the bluffs of the Mississippi, at Muscatine, Iowa, in latitude 41, all the trees of the typical form were killed while this kind survived, and has still survived and flourished. It is planted through all that region, and is reported to be perfectly hardy up to latitude 42 degrees in that portion of the State.

The source of Mr. Foster's trees has recently been traced back to the Dayton group, having been received through an agent or trading nurseryman, who procured them from the brothers Teas of Indiana. A letter from Mr. Foster has just now been received, in which he says: "In 1848 Stephen Whitcher, Esq., moved from Dayton to Muscatine, Iowa; he brought Catalpa seeds in pods and gave them to me. I gave him some of the young trees and planted some myself. These all killed to the ground, but sprouted up again." * * * "In 1853 or 1854 Abraham Morris, from Cardington, Ohio, bought some nursery stock from Mr. Lipsey, which he had brought from J. C. & E. Y. Teas; the seeds from which these plants were produced Mr. John Teas had procured from the historical trees near Dayton, Ohio. That is the pedigree of my Hardy Catalpas."

Correspondence with Mr. Jos. S. Fay, the eminently successful pioneer of the forest-tree planting in Eastern Massachusetts, who is so often and so worthily referred to, develops the interesting fact that our promising Western tree has reached that distant spot, where it is destined in the future to supersede the other species of the Catalpa, which alone has, heretofore, been cultivated in the Eastern States. The owner of the plantations at Wood's Holl has very kindly taken a lively interest in this investigation, and sends a most satisfactory account of the behavior of some trees about Falmouth, on the stormy coast of Cape Cod. He writes, on the authority of Mr. Thomas H. Lawrence of that town, that certain trees, grown from seeds sent from Cincinnati, Ohio, by Joseph Mayhew, are taller and more upright, and bloom earlier than the common kind of Catalpa. These are now about twenty-six years old, and one of them is thirty feet or more in height, and seventeen inches in diameter three feet from the ground.

He also refers to others planted about forty-five years ago by Dr. Cornish, on the premises now occupied by Captain William Bowne, having similar characters and appearance. Of these two trees, which are of nearly equal size, one is twenty-two inches in diameter three feet from the ground, and is forty-five or fifty feet high. The source from whence these older trees came is not known.

Here, in Southern Ohio, both kinds have been planted, and there is scarcely a question between them as to the hardiness of this or that kind, both being sufficiently

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hardy to endure the rigors of the climate. The same may be true of Eastern Pennsylvania, where the Georgia Catalpa has become naturalized, and in places still further North and East along the coast, even in Massachusetts.

Mr. Suel Foster has directed attention to the importance, for Western tree-planters at least, of this question of hardiness, and it has already been demonstrated in Iowa, Kansas and Nebraska, that one kind escapes while the other suffers. It is true that certain trees of the Eastern form have escaped injury in many parts of the Ohio Valley, and have attained large size, hence their happy possessors may claim that their trees are perfectly hardy, but we know, from so many points, that the typical Catalpas have suffered; and as they may again suffer, these trees of doubtful character in this respect should be abandoned for the *hardy kind*, which also has a superior habit of growth. Moreover, this immunity may prove to be exceptional, for the distinguished botanist, Dr. G. Engelmann, of St. Louis, declares that the common Catalpas have sometimes been killed even in that city, which is in latitude 38.37 degrees.

In Dayton, Ohio, latitude about 39.45, the young trees are not unfrequently killed down to the ground by the winter's cold. A correspondent in the north part of the State, Prof. E. W. E. Koch of Toledo, writes: "I know of no Catalpa trees here; the few plants on the high school lot *freeze* down to the ground nearly every winter. The prospect is not flattering for this year's Catalpa growth, with the mercury at minus 16 degrees." This was January 3, 1879.

A solution of the other conundrum, why should one tree be more hardy than the other, need not now be attempted; the fact is established, and it is one of great value and importance in the vast interests of the sylviculture of these Western States, since it will enable us with confidence to present the claims of a most valuable tree, of very short rotation,* to the thousands of tree-planters, who, happily, are now coming to the front in this important branch of agriculture. Most men are too selfish to plant for others trees that may require a century or more for their development, but here is one that will yield satisfactory money results in a quarter of that period, and furnish material that has endured exposure in the soil for three generations of men.

*Making quick returns.

To satisfy the curious, however, in the matter just queried, it may be suggested hypothetically, that, if the two forms ever had a common origin, which for the nonce may be admitted, the long continued *habitat* of one for ages in a hotter region may have gradually wrought such changes in its constitution as have not yet had time to be overcome by the comparatively brief period of a century or so of trial in its forced Northern home.

Is Speciosa a species?—After all, this Western tree, which has long been known to us as a distinct form, and designated as the *Speciosa*, may yet prove to have sufficiently distinct botanical characters to justify the erection of another species besides the *C. bignonioides* of Walter. This nut is left for more critical botanists to crack. Already one of the most acute and learned of the fraternity has taken up the question; he has the nut in his fingers.

Thomas Meehan, Esq., Editor of the *Gardener's Monthly*, Philadelphia, a devotee to Sylviculture and a close observer, says: "Thanks for seed of your Catalpa; I go further than you. I have always thought there was distinction sufficient to make a good *species* out of your Western form. Why not make a careful diagnosis of it when in flower next year? I should be glad to present it for the Proceedings of the Academy of Natural Sciences."—Philadelphia, December 12, 1878.

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THERE ARE TWO KINDS.

DIAGNOSIS.—THE NEW SPECIES ESTABLISHED BY DR. ENGLEMANN.

There need no longer be any question as to the two kinds of Catalpa. No observer who has explored the country watered by the lower Wabash and White Rivers of Indiana, the southern portions of Illinois, the western low lands of Kentucky and Tennessee, and the swampy region of south-eastern Missouri, and the adjoining portion of Arkansas, which lie along the Mississippi between the uplands on the eastern and western sides of the *Delta lands*, will hesitate for a moment in reaching the conclusion, that here he has found the native habitat of a tree that is very different from that which is usually cultivated, and that is known in these Western States only as a cultivated plant, since it is never seen growing wild.

In all the tract just indicated, native Catalpas may be seen in the original forests. Unfortunately these are becoming more and more rare, since the merits of this Catalpa and its lumber have been known and appreciated.

Crossing the State of Arkansas by the St. Louis and Iron Mountain Railroad, the explorer finds that the bottoms of the Arkansas are occupied by trees of the same character; and the whole delta of the great river where Catalpas grow is believed to be occupied by this kind alone. These Mississippi trees and their progeny, wherever found, which can be traced to this source, are all of the *Speciosa* kind; while all others in cultivation are more or less clearly and directly traceable to the hand of the nurseryman, and through his agency to the Atlantic seaboard, and so on back to the accepted origin of the typical form of the *Catalpa bignonioides* in Georgia. Let it be repeated, not one of this latter kind is ever found growing wild in the Western forests; wherever the trees are seen, they are clearly referrible to human agency, and that of very recent date.

DIAGNOSIS OF THE TWO FORMS.

The Species.—*C. bignonioides.—Tree*, as above described (by the botanists), usually low-branched; short-stemmed when in open lands. When planted thickly in groves the stems become taller, but are seldom really straight. Young trees often winter-killed north of the Ohio River.

Bark gray, and in mature trees (or those of twelve years or more) it is scaly, peeling off in small thin plates, very easily separated.

Flowers, as represented in Michaux' plate, tinged with violet, having yellow and purple spots inside the throat, as above described.

Fruit, usually abundant; pods 8 to 15 inches long, somewhat flattened, the valves meeting at an angle, forming a projecting ridge that can be sensibly felt by the fingers, transverse section lenticular, surface slightly uneven, usual color light brown, especially on cultivated trees in this latitude and northward.

Seeds applied end to end, in one or more layers, to a rather flat, grooved, gray placenta, winged as described; entire length, 1 inch to 1 inch 7 lines; breadth, 2 lines; averaging 100 to a pod. The coma or fringe is usually sharply pointed at each end. Well represented in Michaux' plate. Weight, 2,000 to the ounce, says Barney.

Catalpa.—*Variety Speciosa.—Trees* more erect, naturally growing taller, and better furnished with limbs where exposed. In thick groves erect, straight and tall; in natural forests stems 50 feet; the tops of old trees apt to be broken. In cultivation more hardy than the bignonioides.

Bark, in young trees, is light gray, becoming darker with age, adhering closely, and moderately furrowed vertically, much like that of White Ash; when older, it becomes somewhat looser in places.

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Flowers much larger; nearly pure white; markings in the throat clear yellow and purple, very showy; one to three weeks earlier than the common species.

Fruit often less abundant; pods usually longer, 15 to 20 and more inches; 6 to 7 lines in diameter; generally of darker brown color, more cylindrical, and usually marked with distinct parallel grooves in their entire length.

Seeds, winged and fringed at both ends, larger than the species, 1 inch 8 lines long, 3 to 4 lines wide; the coma or brush at the ends is more spread, less pointed, weight 1,000 to 1,200 to the ounce, 1,300 by another count. Texture of the wing membrane more silky and softer, compared with the satiny and harsher tissue of the bignonioides species.

Dr. Englemann, in the "Botanical Gazette," Volume 5, No. 1, January 1880, says:—

"CATALPA SPECIOSA, Warder.—A middle-sized tree with grayish-brown, much cracked or furrowed, at last slightly flaky bark, and light yellowish gray wood; leaves large, truncated, or more or less cordate at base, slenderly acuminate, soft downy on the under side, inodorous; flowers in large and loose panicles; tube of the corolla conical, longer than wide, its lower part scarcely protracted; upper lip, before its expansion, longer than the other lobes, and enveloping them; lower lobe bilobed; inside of corolla slightly marked at the throat with red brown lines, and with two yellow bands at the commissures of the lowest with the lateral lobes; stamens and style as long as the tube, pod terete, strongly furrowed; wings of seed about as long as the seed itself, rounded at the ends and split into a broad coma.

Common in the low, rich, sometimes overflowed, woodlands near the mouth of the Ohio along the lower course of that river and its confluence and in the adjoining lowlands of the Mississippi in the States of Illinois, Indiana, Kentucky, Tennessee, Missouri and Arkansas,* according to Michaux abounding near the borders of all the rivers which empty into the Mississippi further south; whether the localities cited by him in West Florida produce this or the Eastern species is at present unknown.* Flowers in May. This tree has quite an interesing and instructive history. It was already known to Michaux and to many botanists and settlers of those regions; even the oboriginal Shawnees appreciated it, and the French settlers along the Wabash named it for them the Shawnee wood (Bois Chavanon), and prized the indestructible quality of its timber; but the botanists, even the subtle Rafinesque, who roamed over those very regions, seem to have taken it for granted that it was not distinct from the South-Eastern *Catalpa bignonioides*. To me the fact that these trees, then not rarely cultivated in St. Louis, produced their larger and more showy flowers some ten or fifteen days earlier than the Eastern or common kind, was well known as early as 1842, and their blossoming has since been annually recorded in my notes on the advance of vegetation, but I had not the sagacity or curiosity to further investigate the tree. It was reserved to *Dr. J. A. Warder* of Ohio, to draw public attention to it in 1853. He was struck with its beauty in the streets of Dayton, Ohio, where a few stragglers were cultivated, and described it cursorily in his Journal, the *Western Horticultural Review, Vol. III.*, p. 533, without deciding whether a distinct species or a variety, and without assigning a name to it. It was soon named, however, privately as it seems, by him and his friends *Catalpa speciosa*, and was propagated as a more ornamental form. Thirteen years later I find in the catalogue of J. C. Teas' nursery, Raysville, Indiana, for 1866, *Catalpa speciosa* offered, the 100 one year old seedlings for $1.50. But only within the last few years the beauty and importance of the tree has made a greater impression on the public mind, principally through the exertions of Dr. Warder himself, Mr. E. E. Barney of Dayton, and Mr. R. Douglas of Waukegan, Ill. The latter was so much struck with the future importance of this species that in the Autumn of 1878 he collected on the Lower Ohio 400 pounds of its seed for his own nursery and for distribution to all parts of the world.

Catalpa speciosa replaces *C. bignonioides* entirely in the Mississippi Valley. It is readily distinguished from it by its taller and straighter growth, its darker, thicker (½ to 1 inch thick), rougher and scarcely exfoliating bark (in the older species it is light gray, constantly peeling off, and therefore not more than 2 or 3 lines thick); its softly downy, slenderly acuminate and inodorous leaves (those of *bignonoides* have a disagreeable, almost fetid, odor when touched), marked with similar glands in the axils of the principal veins of the under side; by its much less crowded panicle, and by its much larger flower, fruit and seed. The flowers I found 2 inches in the vertical and a little more in the transverse diameter; the lower lobe is deeply notched or bilobed in

*All the specimens received from the vicinity of the Atlantic and Gulf coasts are C. bignonioides.

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speciosa, entire in *bignonioides;* the tube in the former is conical and 10 lines, in the latter campanulate and about 7 lines long; in the first slightly oblique, in the other very much so—the upper part being a great deal shorter than the lower one, so that the anthers and stigma become uncovered; the markings on the old species are much more crowded and conspicuous, so as to give to the whole flower a dingy appearance, while ours looks almost white. The upper lip of the corolla before expansion extends beyond the other lobes and covers them like a hood in the Western species, while in the Eastern it is much shorter than the others and covers them only very partially. The pods of our species are 8 to 20 inches long, 17 to 20 lines in circumference, dark brown and strongly grooved, when dry, the placental dissepiment very thick; in the Eastern species the pod is nearly the same length, but only 9 to 12 lines in circumference, its grooves very slight, its color pale, and the dissepiment flat. In both species the pod is perfectly terete before the valves separate, after that the valves of ours remain more or less semi-terete, while the much thinner ones of the other flatten out, so that they *seem* to indicate a compressed pod. The elongated seeds, winged at both ends, are of about equal length in both species, but in *speciosa* they are much wider, 3½ to 4 lines, and the wings have more or less rounded ends which terminate in a broad band of rather short hair; in *bignonioides* the seeds are only 2½ to 3 lines wide, with pointed wings, and their tips terminating in a long, pencil-shaped tuft of hair.

Our tree is larger, of straighter growth, and, being a native of a more northern latitude, is hardier than the south-eastern species; the wood of both is extremely durable, perhaps as much so as that of our red cedar, and has the advantage over it of a much more rapid growth, and of possessing only a very thin layer (2 or 3 annual rings) of destructible sapwood. But of these qualities and of its adaptability to many important uses, others, and especially Mr. Barney in a recent pamphlet, have given a full account. It is already extensively planted in our Western prairie States, as especially along railroads, for which it is expected to furnish the much needed timber in a comparatively short time."

QUALITY OF THE LUMBER.—HABITAT.—RANGE.—ADAPTATION TO SOILS.

The wood of the Catalpa is light, and yet it is sufficiently strong, and it is hard enough for most purposes of construction. It has been highly approved for bridge timbers where it is exposed to the weather; it has been the favorite material for fence-posts in a large tract of country; it works easily in making shingles, which have been found to last longer than the houses they covered, and in one case we are told that *they were really taken off and used in another building.

Mr. Barney, on page 8 of his pamphlet,† gives the following results of experiments to test the strength and resistance to pressure of this and other woods:

"I subjected pieces one inch square to a breaking pressure twelve inches between supports.

Catalpa broke under a pressure of 708 lbs.					
Ash broke under a pressure of 800 lbs.					
Oak	"	"	"	709 "	mean, 809 lbs.
Oak	"	"	"	577 "	
Oak	"	"	"	1,141 "	

The Catalpa deflected three times as much as the Ash or Oak before breaking."

"Five thousand pounds pressure on blocks of one inch square by three inches long compressed the

Oak 10-16 of an inch.
" " " "
" 8-16 " "
Catalpa 7-16 of an inch.
" 9-16 " "
" 7-16 " "
White Pine 5-16 of an inch.
Norway Pine 6-16 of an inch.
White Walnut 5-16 of an inch.
Yellow Pine 6-16 of an inch.
Black Walnut 10-16 of an inch.
" " 8-16 " "
Ash 14-16 of an inch.
" 6-16 " "

* J. C. Teas' Report to Indiana Horticultural Society. † Facts and Information. 1879.

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"These samples were taken at random, and would indicate that Catalpa will bear the pressure to which it is subjected when used as a railway tie. Catalpa ties placed in the track near our office all hold their spikes well, and show no signs of mashing more than oak on each side of them. Over these heavily loaded trains pass almost hourly. The road-master, who has watched them with much interest, says he has no better ties on the line of his road."

On the Saint Louis and Iron Mountain Railroad, near Charlestown, Missouri, there is a portion of the track laid eleven years ago on Catalpa sleepers, which are yet sound, while many of the oak fence-posts inclosing the road, though planted since it was built, have need to be replaced. The oak ties last scarcely five years on the same soil and exposure. Mr. David Axtel, the intelligent engineer in charge of this part of the road, reports that Catalpa holds the spikes well enough, and that when the ties become mashed they are no longer rejected, but simply turned over, so as to present a new bearing. Some that had been thrown out by the track-men have been used as fence-posts, and bid fair to last for many years.

In his letter to Mr. Barney the same gentleman writes: "There is nothing to indicate that the Catalpa ties in our track do not hold spikes sufficiently well. Nearly all the spikes are in the same holes originally made when driving them. There has been no spreading of the track. I have examined the few ties the rails have settled into, and find none that will not last a number of years by turning them over. These ties are six and eight inches face; if they were wider, as you suggest, there would be more resistance to crushing." * * *

Before passing from this branch of the subject, the peculiar ligneous structure of this tree should be more particularly noted. The alburnum or sap-wood is very limited, and consists of but one or two of the concentric layers, generally, indeed, that of the last year's growth only; so that, in the preparation of cross-ties, a stick, twelve inches or more in diameter, needs only to be split, or sawed, so as to make two sleepers, instead of the more expensive hewing required to make but one from the same material. The timber, in this shape, with the maximum extent of bearing for the rail, and having only the bark and a thin layer subject to decay, may be laid with its convex side next the road-bed, in the best position for tamping the tie when placed in the track.

Little need be added to the mass of facts collected by Mr. Barney, going to show that the wood of the Catalpa is strong and hard enough for most economic purposes; that it works smoothly and takes a beautiful surface, and is sufficiently varied in its tints to make it highly ornamental for inside finish. At the same time, though light, it is perdurable for all purposes where it is exposed to the elements.

Dr. Schneck of Mt. Carmel, Illinois, states that the lumber, on account of these qualities, has been in great repute near the mouth of the Wabash, "for the building of skiffs, and that it is being rapidly exhausted in other localities by the constant demand upon the trees for fence-posts; these are taken to a great distance, and the trees are often cut at night and stolen." Similar testimony is borne by James Bell, an extensive dealer and manufacturer of lumber at Ullin, Illinois. J. T. Mills, Esq., of the Evansville & Terre Haute Railroad, is purchasing many thousands of these posts to fence the road; and has also planted largely on the White River for future use.

In all the Delta region of four or five States surrounding Cairo, Illinois, particularly on the west bank of the great river, Catalpa has been in such demand for fence-posts and foundation logs, that the accessible stock of standing trees is well nigh exhausted. In that low tract of humid soil, sections of Catalpa logs are used to support the corners of the buildings erected there, and they make the most permanent foundations—"corner stones."

Near New Madrid, there are many fence-posts which have stood and remained perfectly sound for long periods, 20, 30, and even 40 years. The story of the standing

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Catalpa trees that were killed by the disturbances and submergence of land, caused by the earthquake of 1811, which we have all been disposed to doubt, is to this day fully confirmed by occular demonstration. In the lagoons, there stand the broken shafts of noble trees; all other species, submerged by the same catastrophe, have crumbled and fallen into the water long ago, but these silent monuments of that convulsion still remain, not as living witnesses, but as dead memorials of the disturbance of level, which caused their death, and their now approaching dissolution; but there have they stood for seventy years, under conditions most favorable to decay, and thence are they brought, when cut, and are used for fencing.

Range and Native Habitats.—The Catalpa, in one or other of its forms, has been found to be indigenous from the Gulf of Mexico in West Florida, and on the rivers of Alabama and Georgia, westward and northward along the Mississippi and its southern tributaries in the great delta formation, to above the mouth of the Ohio, thence up the Wabash and the White Rivers of Indiana to its most northerly point, hitherto known near Vincennes in latitude 38.42. It is supposed also to exist along the Tennessee and the Cumberland Rivers, having been seen near the embouchures of those streams into the Ohio. We have yet to learn where the two species coalesce, or are separated; but as all which have been examined on the Western waters are the *C. speciosa*, while those from the eastern and southern slopes of the Alleghenies are as clearly *C. bignonioides*, we are forced to the conclusion that that great water-shed must separate the species.

In all its native habitats, the *C. speciosa* affects chiefly the low, rich, damp bottom lands, whereas in its south-easterly range the *Catalpa bignonioides* is found on the rocky banks of rivers as well as on the bottom lands.

Adaptation to Soil and Climate.—With wonderful powers of accommodation, however, this tree has been found to adapt itself to almost every kind of soil. It thrives, and even becomes naturalized, reproducing itself in situations very different from those of its native homes. This it has done upon the hungry gravels about Baltimore and Washington, and upon the mica-schists of Eastern Pennsylvania, as well as in the limestone valleys of that State. It thrives on the tertiary sands and gravels of New Jersey, near the Atlantic coast, and on the red sandstone of that State. It is found on the clay and gravel drifts of Southern New York, as well as on the Hudson, where Downing used it to retain the river banks. It may be seen on the hard conglomerate of the drift-scored rocks of Dorchester heights, and it thrives on the sands of Cape Cod.

So, also, in its Western migrations, it seems to thrive everywhere; at Cincinnati upon the tenacious clays, the resultant debris of the old silurian limestones, on the modified drift of the river terraces, and on the rich alluvium of the bottom lands, it seems equally at home. About Dayton it thrives on the terraces and bottom lands of the Miami, and at Columbus upon the rich walnut lands that rest upon the boulder drift which has plowed through the Devonian shales and the upper silurian limestones. At Chilicothe on the Scioto it appears to be satisfied with the hills of the Waverly sandstone, and at Marietta, where it was planted at an early day, it has become naturalized upon the debris of the coal measures there cut through by the Muskingum.

And in the States west of Ohio to which this tree has been taken, it thrives upon all soils and everywhere, if not too cold. Among the stumps of the heavily timbered lands of Indiana, and out in the open prairies of Illinois, it does equally well, but it is especially thrifty upon the great deposites of the Loess or Bluff formation of Missouri, Iowa and Nebraska, and parts of Kansas.

In this respect the Catalpa seems to have the advantage over some other trees in its wonderful power of adaptation, and hence its great promise as an element of success in the up-building of American forestry.

Mr. Robert Douglas of Illinois, who has propagated the Speciosa Catalpa more

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largely than any one else, and who has planted some hundreds of thousands of them on the plains of Kansas, pronounces this Western species, which he has thoroughly studied in its native forest and artificial plantation, "one of the best, if not the very best tree, that has yet been introduced for timber plantations in the Middle States.

PROPAGATION—PLANTATIONS—TRIMMING—THINNING—INSECTS—CONCLUSION.

The *propagation* of the Catalpa is very simple and easy. The plants may be multiplied by cuttings where that method is desired; it has been practiced to a limited extent. In the Western forests limbs of fallen trees take root in the humid soil, and produce new trees, natural layers, giving us a hint that is put in practice when we desire to increase our stock of the dwarf kind that has never blossomed. This form and some sports, with colored foliage, may also be multiplied by grafting and budding.

But it is always best to increase our stock of these trees by sowing the seeds, which is, indeed, the only practicable method of producing the millions of plants that will be needed, so soon as the merits of this tree are appreciated. The seeds germinate readily, the plants grow rapidly, and are ready to set out after one summer's growth. The seed should be kept dry during the winter, safe from the mice, and need not be planted until the soil is warmed. The soil being well prepared, a shallow drill is made. This can be done with a small plow. In this the seed is strewn rather thickly, so as to lie one or two inches apart and four or five inches wide. They should be at once covered with fine soil, from one quarter to half an inch deep, according to the condition of the ground as to humidity, and the prospects for showers. If the conditions be favorable they soon vegetate, when the young plants should be well cultivated and kept clear of weeds, especially during the first part of the season.

The leaves fall with the first frost, and, after standing a few days to harden up their tissues, the young plants may be taken up with the spade, or by using the small tree-digger plow, or even a common one-horse plow, when they should be assorted for size, and put into cellars or heeled-in deeply out of doors, unless indeed they be at once planted in their permanent stations.

Plantations.—With a proper selection of the kind—that is, of course, the favorite *Catalpa speciosa*—no one need hesitate to undertake a plantation. The trees are sure to grow, are easily cultivated, and speedily yield satisfactory returns of the most valuable material.

If in the prairie regions, where the railroads are most in need of cultivated forests, to furnish the future supplies of ties, posts and other lumber, land should be selected that has already been in cultivation for one or more years. This should be well plowed in the Fall, and may then at once be planted, or left to lie fallow over Winter.

The planting is a very simple affair when once a gang of hands has been organized; and each man will set from one thousand to fifteen hundred in a day. After the surface has been marked out, with furrows four feet apart, the little trees are dropped at about the same distance, and at once planted with the spade, and the soil is closely tramped by the feet. As the rows are set, or soon after, a one-horse plow follows, to bank them up slightly. In Fall planting this furrow may be made rather heavy, to protect the little plants and lead the surface water from them. This ridge will have to be worked down with harrow or cultivator in the Spring, before the buds have started, and such cultivation will destroy the first crop of weeds. Cultivation should be continued at intervals during the Summer, so as to keep the ground clear of weeds, and to encourage the growth of the young trees, which will have made sturdy shoots of from one to four feet high, and will be well established in the soil.

If some of the little trees be crooked or branched, no matter, for during the winter

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or in early Spring they may all be cut off near the surface of the ground, to secure a strong, thrifty and even growth the next Summer, when, if sufficiently cultivated up to July, the result will be most satisfactory and encouraging, in an even stand of sturdy trees, averaging not more than four feet apart, and reaching a height of five, six, or more feet, and so completely shading the ground that no further cultivation will be needed beyond cutting out a weed here and there during the next season.

If the growth have not been very strong the first season, it may be advisable to defer the cutting back for another year, by which time the roots will have become so much more fully established that the shoots will be proportionately robust; so that, with proper cultivation and removing superfluous shoots, leaving only one to each plant, the result will be a stronger growth of taller trees, and at the end of the third summer from planting they will average six feet in height.

This treatment is especially recommended because of the peculiar leaf arrangement, or phyllotaxy, in the Catalpa, which is in whorls of three, hence the tendency to throw out from the group of terminal buds as many shoots, that cause the trees to be low branched, and to require some attention in pruning; the higher the stocks, therefore, the better. The close planting here advised is also recommended with a view to obviating this difficulty, as the surplus shoots will be smothered and die where thus crowded, and little or no pruning will be required to remove them.

Thinning may become necessary after a few years, but an experience of seven or eight years in my own limited plantations induces the belief that natural causes will very nearly suffice to thin out the surplus trees with very little interference by human agency. Further on it may become necessary to use the ax in thinning out the trees to enable them to develop themselves; but we should not count too confidently upon the profits to be derived from this source. Some poles may be had for fencing and other economical purposes, for garden and vineyard stakes, and even for hop-poles, to all which uses the lightness and durability of the material well adapts it. Time and experience will give us further insight into the details of trimming and of thinning the plantations.

Insects.—Among the many cultivated trees of this region none appear to have so few insect enemies as the one now under consideration. The almost universal testimony with regard to the Catalpa tree, and often cited in its favor by amateur planters, is that it is not affected by insects, which are so destructive of some other species of planted trees.

In its native habitats, however, both Western and Southern, the foliage is eaten to such an extent as to strip the trees in midsummer. This is done by a large, greenish, naked caterpillar. Dr. Schenck of Mt. Carmel, Illinois, cites the ravages of this insect as one reason why the tree is not cultivated by the good people of that region, who dislike these caterpillars, and are also prejudiced against the tree, which is thought to be poisonous.

My good friend Professor C. V. Riley, United States Entomologist, reports that this is the larva of the *Sphinx Catalpa* (Bois duval), one of the most beautiful of the Sphinges.

Mr. L. B. Parsons of Flora, Illinois, long President of the Ohio and Mississippi Railway, who had planted Catalpas, says that the foliage was attacked a few years ago, and that, after trying other means, he effectually banished the caterpillars by applying Paris Green and water with a garden engine.

Conclusion.—In drawing this monograph to a conclusion, it may be well to impress upon the reader the exceedingly important fact that we have in the United States two very distinct species of Catalpa, one of which is especially Western in its native habitat. This species is in every way a superior tree for our uses, and promises to be a most important factor in our future forest plantations. It is superior in its habit and

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in its hardiness. What has been said of the value of Catalpa lumber may be equally true of either kind, except that our tree alone will be able to produce dimension timbers; hence, so far as at present advised and informed, you are begged to plant no other than the *Catalpa Speciosa* as an economical tree. The others may do on a lawn or in the park, but this alone should constitute our groves and plantations planted for utility.

Think not, however, that we who have manifested so great an interest in this tree which we have so highly recommended to you, think not that we would have you restrict yourselves to any one tree. We have indeed, a noble sylva, a rich inheritance of trees, from which to make our selections. These have various excellencies, and are severally adapted to diverse uses, and to different situations, as to soil, aspect and elevation above the sea-level. Some are peculiarly adapted to almost every portion of our extended country, where others would not succeed. Let each planter use his own good judgment in the selection of the several kinds best adapted to his own particular local conditions.

To the great railroad corporations, who should be the first to improve their vast estates on our Western plains by timber planting, the *Catalpa Speciosa* is confidently presented as invaluable.

JOHN A. WARDER.

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THE BOVINE LUNG PLAGUE.

CONTAGIOUS PLEURO-PNEUMONIA OF CATTLE.

BY

JAMES LAW,

PROFESSOR OF VETERINARY SCIENCE, CORNELL UNIVERSITY, ITHACA, N. Y.

HISTORY.

ITS PERENNIAL HOME.

The record of any one plague of animals bears a close resemblance to that of each of the others. There is ever some country or district where the contagion prevails continually, and from which it extends, at more or less frequent intervals, to devastate neighboring States, and even the more distant lands with which such States keep up a traffic in animals. On the Eastern Continent the infested district consists of the endless uncultivated Steppes of European and Asiatic Russia. These Steppes are immense plains of the richest alluvial soil, very little of which is inclosed with fences, while a great portion is but an immense common pasture land. On these wander promiscuously the herds of the Tartar tribes, and there are raised countless cattle and sheep that are shipped to Central and Western Europe, whenever there is an extra demand for meat for the toiling millions, or, above all, for belligerent armies. From time immemorial these Steppes have been devastated by Rinderpest, Lung Plague, Sheep-pox and other pestilences, and in all instances where the sources of such plagues have been perseveringly traced they have been found to lead back to these fenceless plains.

The Rinderpest, which by its extreme fatality ever attracts more attention than the less fatal animal pestilences and those of slower development and progress, is first recorded in Europe as having traveled in the wake of Atilla and his Huns, who descended from these same pestilential regions and drew after him the cattle necessary for the supply of his army. The plague introduced into his commissariat parks at the outset was necessarily kept up by the infection of all the successive additions made in the different countries overrun, and it thus reached to the very gates of Rome, and later to Western Europe.

Down to very recent times the distinction between the different plagues was rarely made, and that which developed the most speedily and proved the most fatal in its consequences is the one which is generally recorded; yet in the light of modern experience we can infer with the greatest probability what was the experience of remoter epochs. In the last two centuries any great invasion of Western Europe by the plagues of cattle followed a course of this kind. First appeared the Foot and Mouth Disease with an incubation of one or two days, speedily followed by the incomparably more fatal Rinderpest with its latent period of four to six days. As the last affection supervened so speedily on the first, and cut off its victims by hundreds and thousands it alone got a place on the record; and if the other was mentioned at all it is only as a phase of the one dread disease. Later still, after weeks or months, the slowly developing Lung Plague appeared, and as its progress through a herd was so much

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more tardy, it was too often looked upon as the mere dregs of the more speedily fatal malady. It must not be expected therefore, that we can find in ancient writings any distinct mention of the Lung Plague of Cattle. Its existence is rather to be inferred from the constant experience of later years, than from any distinct and unequivocal statement.

EARLIEST RECORDS.

Yet even in ancient times we meet with isolated statements that very distinctly refer to this plague. Aristotle, witing in the fourth century before the Christian era, says: "The cattle *which live in herds* are subject to a malady during which the breathing becomes hot and frequent. The ears droop, and they cannot eat. They die rapidly, and the lungs are found spoiled." Here the prevalence of the affection where cattle are collected in large herds, the fact that cattle alone suffered, the heavy mortality, and the disease and destruction of the lungs, all point to the lung plague. References to lung diseases in cattle are made by Livy, Vegetius, Silvius Italicus, Columella, Virgil, &c., but they are less characteristic than the remarks of Aristotle. Columella, writing in the middle of the first century, refers to the cattle disease thus: "Est etiam illa gravis pernicies cum pulmo exulcerative, inde tussis et macies, etad ultimum phthisis invadit." "There is also a heavy mortality with ulceration of the lungs, producing cough and emaciation, and finally phthisis." Prevailing as this did in cattle, and attending and following the great wars for the extension of the Roman Empire and Republic, there are strong grounds for supposing that this was the genuine Bovine Lung Plague.

MORE RECENT HISTORY.

Valentine, writing in 1693, describes a pulmonary affection of cattle then prevailing in Hesse: "The preceding winter being wet, but towards its close very cold, at the beginning of Spring an unusual heat set in and continued throughout the whole Summer, which sudden change produced an unequal and unnatural movement of the limbs and breath, followed by death to man and beast. Oxen and cows succumbed in great numbers. From the observations of the butchers, it was proved that these animals died of pulmonary phthisis, to which, without doubt, the intense heat succeeding the severe cold much contributed." Delafond, Fleming and others doubt that this was the Lung Plague, but the facts of its extensive prevalence, its fatality, and that it was confined to cattle, all point to this affection. Moreover, the generally disturbed state of Europe before this period, the wars between the Poles and Turks, Swedes and Russians, Italians, French and Savoyards, French and Dutch, &c., would imply, as in later times, the extension of the different animal plagues. The coincident existence of the Foot and Mouth disease, as reported by Stewzell and Dederich in 1686, and by Valentine in 1695, during the war in Flanders, fully supports this conclusion. That Valentini attributed the lung disease to the cold and heat is not surprising, when we consider that, with all the accumulated lore of the ninteenth century, physicians can still be found who seek for the origin of this and other plagues in the peculiarities of the seasons.

In 1726 and 1727 the Lung Plague prevailed in Switzerland and adjacent countries, and continued in various localities until 1739 (Wirth). This was also a period of wide prevalence of the Rinderpest, evidently caused by the wars of Charles XII., and of the Spanish Succession.

In 1743 Lung Plague prevailed in Suabia (Wirth), in 1764 in Pomerania (Trumpy), about 1769–70 it was prevalent year after year in Franche Compte (Bourgelat), in 1769 in Fulda, Germany (Wirth), and in 1772 in Nassau prevailing almost interruptedly until 1830 (Franque). From 1774–6 it is reported as ravaging Istria and Dalmatia (Fanti), and was still existing at the former place in 1790 (Orus, Bottani), Wurtemburg

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and Silesia suffered from 1778–90 (Rausch, Wirth), Bavaria in 1786–91 (Plank, Laubruder), and Franconia in 1792 (Hensinger).

FRENCH RECORDS.

In France we have records of it from 1772 up to the end of the century. Huzard, Chabert and Vicq d' Azyr report the disease in the vicinity of Paris in 1772–94, a fitting sequel to the observations of Bourgelat in 1769. There is thus evidence of its wide extension in the time succeeding the wars of the Austrian Succession and the Seven Years' War, yet the records are very incomplete, and isolated observers state the case as it appeared to their restricted vision. Thus, in apparent partial contradiction of the remarks of Huzard, &c., as quoted above, Lafosse asserts that from 1769–89, it was almost exclusively confined to the mountains of Switzerland, of Jura, of Dauphiny, of Vosges, of Piedmont, and of Upper Silesia, but that it spread widely on the plains of the different countries in connexion with the wars of the French Revolution. This is doubtless true so far as that it was continuously present on these mountains, where, in the absence of fences, herd mingled with herd and infected them, whereas on the plains, where cattle were kept in enclosed fields, the malady found no such facilities for its maintenance, and was at once more circumscribed and less noticed. That the cause of the plague is not to be found in the mountainous elevation and exposure is sufficiently shown by its absence to the present day in the Pyrenees where no cattle from Eastern Europe are taken, in the mountains of Norway and Sweden, and in the Highlands of Scotland. Delafond adds Hesse and Suabia to the countries where the plague had habitually prevailed prior to this time.

EFFECTS OF THE NAPOLEONIC WARS, ETC.

Since the Napoleonic Wars Lung Plague has been constantly present in most of the countries of Western Europe from Holstein on the north to Spain on the south; in other words, it has prevailed in those countries which were the theatre of most of the great wars, and which in times of peace have been in the line of the cattle traffic from the infected east of Europe to the great workshop and market of Great Britian. Thus we have reports of its prevalence in Prussia from 1802 (Sick) at short intervals up to the present time (Diderichs, Laubender, Wagenfeld, Gielen, Sauberg, Seer, Keurs, Hering, &c.). In Hanover it has prevailed continually since 1807 (Haussmann, Gerlach, &c.). Similar remarks would apply to the Tyrol, Upper Austria and France. During the present century it has been studied in Russia. Bojauns recorded it in Lithuania, and later Jessen in 1824. Bidder reports its ravages in 1831 in Courland, Haupt at different times in Siberia, and Unterberger, Rawitsch and others quite frequently in different parts of the Russian Empire in recent years. The Indian Veterinary Commission report it as quite prevalent and destructive in Hindostan, and there can be no doubt that it is common all over Central Asia and Eastern Europe where, like the Rinderpest and other animal plagues, it has prevailed from time immemorial. The absence of any earlier record of the disease in Russia is to be accounted for by the absence of veterinarians and the continual co-existence of two such rapidly fatal cattle plagues as the Rinderpest and Siberian Boil Plague. The Lung Plague, so much less rapid in its development and progress, is necessarily to a great extent overshadowed by these, and by the common mind is confounded with them.

INFECTION OF THE BRITISH ISLES.

From Holland the plague reached Great Britain and America, so that its history there is more directly interesting to us. Infected cattle entered Gelderland in 1833, that province having been apparently sound for some time previous. In 1835 it extended to Utrecht and South Holland, and prevailed especially in the neighborhood of

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the great cattle marts of Rotterdam and Schiedam. From thence it spread universally in Holland, infecting those districts that had hitherto escaped, and extending to the Island of Zealand. About 1839 the British Consul at The Hague sent some Dutch cattle to a friend residing near Cork, Ireland. These conveyed in their systems the seeds of this infection, and became the nucleus from which the plague spread, in the course of three years, over the whole of the island. The peculiar character of the cattle trade greatly favored this extension, and does so to the present day. In Ireland many calves are taken from the cows as soon as dropped, and raised artificially. As they are thus brought together from a great many different herds, there is ample opportunity for the introduction of the infection into such herds of calves. Later, when they are sufficiently advanced to be turned out to grass, they are assorted in classes according to size and excellence, sent to the market, and resold to persons who make it their business to handle the larger calves. This process is repeated often three times a year, and not in the first year only, but in the second and third as well, so that ere the stock are full grown, or fit to be killed for beef, they have passed through the hands of at least ten different owners, and each time have been exposed in a public market, where they come in contact with thousands of cattle from all different quarters. Worse than all, in the intervals between these sales the stock are often turned out on common pastures, on which they are received at so much per head, and where, accordingly, the cattle of twenty, fifty or a hundred different owners mingle freely. Next to an open, unfenced country, this offers the most favorable conditions conceivable for the propagation of infection from herd to herd; and, therefore, it is no wonder that from that date Ireland has been constantly ravaged by the Lung Plague.

From Ireland the plagne reached England by infected cattle about 1840–1, and the following year (1842) *The Free Trade Act* came into operation, and from that time Great Britain was placed between two fires, and received every day cattle from the infected countries of Europe on the one hand, and from Ireland on the other. The plague was first recorded about London and the South of England, but spread rapidly, and reached Edinburgh in November, 1842, by English cattle sold at *All Hallow Fair.* A year later it had extended to Inverness, in the extreme north, and the island might be said to be generally infected. Yet the Scottish Highlands, breeding their own stock, remained uninfected throughout, and continue so to the present day.

INFECTION OF SWEDEN.

In 1847 the plague was introduced into Sweden by English stock, but was *stamped out* by the authorities,

INFECTION OF DENMARK.

In the same year Ayrshire cattle conveyed the disease from Scotland to Denmark, but this was speedily stamped out, as were several subsequent importations.

INFECTION OF SCHLESWIG.

Schleswig-Holstein also imported Lung Plague in Ayrshires in 1860, and on several other occasions the pestilence gained access to the Duchy, and most seriously on the occasion of its dismemberment by the Prusso-Danish war; but in every instance the people met it by vigorous suppressive measures, and promptly exterminated it.

INFECTION OF NORWAY.

Norway was infected by Ayrshires imported in 1860. The plague broke out 104 days after their arrival, and they were closely quarantined until all danger was past—the native cattle that had come in contact with them having been meanwhile slaughtered.

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LUNG PLAGUE IN OLDENBURG.

Oldenburg also derived the disease from Britain through Ayrshires imported in 1858. She followed the good example of her neighbors and soon crushed out the pestilence.

LUNG PLAGUE IN SOUTH AFRICA.

Into South Africa the Lung Plague was imported in 1854 in the body of a Dutch bull imported by a gentlemen of Cape Town for the improvement of his herd. The bull was two months on the passage from Holland, and did not sicken until he had been six weeks at the Cape. From him the disease has spread over the whole of South Africa, and has defied all attempts to arrest its progress. The country is, like the Steppes of Europe and Asia, a great open pasture land, and the wealth of the colonists consists mainly in cattle, which roam in common on the expanse. There all transport is effected by ox-teams, which travel many hundreds of miles to and from the interior, and in their bodies receive the germs of the plague and carry them everywhere. Under such conditions it is no wonder that the pestilence proved incontrollable and that the only available resorts have been to lessen the losses by producing the disease artificially by inoculation, and to give up the cattle raising in favor of sheep.

LUNG PLAGUE IN AUSTRALIA.

Into Australia the infection was carried from England in 1859 in the body of a Shorthorn cow. She was three months on the voyage out, and had been a fortnight at Melbourne when she was noticed ill. The sick cow, together with all of her owner's (Mr. Boodle) herd were slaughtered and paid for by public subscription, and his premises shut up. This would have ended the matter had not a teamster turned his oxen on Mr. Boodle's rich and secluded pastures at night and removed them before daylight. These working oxen contracted the disease, and had spread it too widely for control before its existence was suspected. Tens of thousands of cattle were killed in the vain hope of arresting the plague, but on the open pasturages this was found to be impossible; it quickly spread from Victoria to the other colonies, and the stock owners had to fall back on the palliative of inoculation, or turn their attention to sheep.

LUNG PLAGUE IN MASSACHUSETTS.

The Lung Plague reached America by a series of importations, one of the more recent of which I shall mention first, as its history is complete, the infection having been finally extinguished fifteen years ago.

In 1859 W. W. Cheenry of Belmont, near Boston, imported four Dutch cows, which he shipped at Rotterdam early in April and landed at Boston on the 23d May. Two had been sick on the voyage and had to be conveyed in wagons to the farm at Belmont. One had to be killed May 30th, and the second died June 2d. A third sickened June 20th and died on the 30th. The fourth recovered. Early in August a fifth cow (Lady Louise, imported 1852) took ill, and on the 20th she died. Several others died in rapid succession, and the disease was then recognized as the Lung Plague of Europe. Thirty head in all perished (one-half the herd), the last victim being the mammoth cow Lady Washington, which died January 8th, 1860.

Before the disease was recognized three calves had been sold to Curtiss Stoddart, North Brookfield, and these conveyed the disease to the farms of the Stoddarts, father and son, whence it spread to others by proximity, sale, &c. One heifer sold by Curtiss Stoddart conveyed the infection to no less than 200 head of cattle. Another case is that of a yoke of oxen infected from L. Stoddart's herd, which assisted with twenty-three yoke in moving a building, and infected the eleven herds to which these oxen belonged. In the next four years the plague was found to exist in 19 separate towns, and on Deer Island, where it had been conveyed by infected cattle.

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In the Spring of 1860 the State Legislature appointed a Commission "to provide for the extirpation of the disease called pleuro-pneumonia among cattle," which was continued, with some intermissions, until 1866, when the Commonwealth was definitely pronounced clear. This Commission, in the course of their work, slaughtered 1,164 cattle, and expended $67,511.07, in addition to $10,000 laid out by different towns at a time when the Commission was temporarily suspended. Thus the plague cost Massachusetts $77,511.07, in addition to losses by deaths, depreciation, loss of fodder, pastures, buildings, &c.

LUNG PLAGUE IN NEW YORK, NEW JERSEY AND ADJACENT STATES.

The only other importation into America that need be named is that of the infected cow bought by Peter Dunn of Brooklyn from the captain of an English ship in 1843. This was placed in Dunn's milk stable, near South Ferry, where she soon sickened and died, but conveyed the infection to the other occupants of the building. From these it spread to other stables in the vicinity, and soon the whole of Brooklyn was involved. Among others, the distillery stables in Skillman street were early infected, and there the disease prevailed as long as those stables were kept in use. There it was seen and recognized by the Massachusetts Commissioners in 1863, twenty years after its introduction.

As the cattle from infected herds could be bought at reduced prices, dealers naturally availed of this, and by the movement and sale of such cattle the malady soon spread to the adjacent cities of New York, Jersey City, Newark, &c., as well as for a limited distance into country districts. Repeated extensions into Connecticut were recognized and stamped out. Not so the extensions to the south. The disease extended from town to town, and from city to city, through New Jersey, Eastern Pennsylvania and Maryland, and finally reached Virginia and the District of Columbia. In its progress it was recognized by Jennings, Michener, Gamgee and others; and spasmodic attempts were made to stamp it out in circumscribed localities, but, as there was no uniform nor concerted action the good effects were merely local and temporary, and the plague held on its course with but little real interruption.

The reason why the malady should have spread from New York southward, instead of northward and westward, is to be accounted for mainly on geographical and municipal grounds. The infected districts in New Jersey, Delaware, Pennsylvania, Maryland and Virginia are all east of the Alleghany Mountains, and consist of comparatively flat, fertile lands, dotted with considerable cities and large villages. In a distance of 250 miles from New York, there are the following, among others: Newark, Elizabeth, New Brunswick, Trenton, Easton, Reading, Burlington, Camden, Germantown, Philadelphia, Wilmington, Dover, Baltimore, Annapolis, Georgetown, Washington and Alexandria. Each of these cities has numerous urban and suburban lots and tracts of ground as yet unused for buildings, and lying practically as open commons, on which any one is at liberty to pasture his animals. On these commons and unfenced pastures met the family cows of the poor, the herds of the small milkmen, and the passing cattle of dealers and drovers, and thus, through the entire Summer, the infection, where it had once been introduced, spread from cow to cow, and from herd to herd. These common pasture grounds in the vicinitiy of the growing cities became the counterparts on a small scale of the plague-perpetuating Steppes of Asia and Eastern Europe, of the open mountains of Central Europe, and of the fenceless grazing plains of South Africa and Australia. It was only necessary to introduce the Lung Plague into one of these cities to render it a perpetual focus of infection, from which the plague could extend in any direction, as opportunity offered. In such places it was next to impossible for the plague to die out of its own accord, for there was a constant influx of new cattle to keep up the supply of milk, and this fresh material was but

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more fuel added to the flame. On a confined or well-fenced farm, where the stock belonged to a single owner, the expediency of avoiding new purchases until the disease had literally burnt itself out was fully appreciated, and thus there was usually a limit to its duration; but on the open commons of the cities and villages this natural extinction was impossible, and everything conspired to preserve the infection. With many the loss of a cow was but *a stroke of ill luck;* the more intelligent realized that the cows which recovered were safe from future attack, and therefore specially valuable. The high prices of milk made cow-keeping remunerative, in spite of frequent losses, and under these influences the numerous deaths but served to increase the purchases of fresh and susceptible animals, and these in their turn falling victims to the disease maintained the affection in an unending series of cases. As illustrating the baleful influence of these common pasturages, it may be noted that around such towns and villages the Lung Plague has always been more extensively prevalent at the end of Autumn, after a season of commingling of herds, than in Spring, after a Winter's comparative seclusion in the stables. The result is exactly the opposite of what would arise from mere climatic and hygienic conditions, for the mild temperature and wholesome breezes of the open fields in Summer must be much more salubrious than the hot, foul stable atmosphere and the chilling storms of Winter. This serves to place in the strongest light the one known cause of the plague—contagion—and to emphasize the necessity for the most stringent restriction of movement of cattle in infected districts.

As regards the danger of infection of the cities in question, they are all near enough to New York and Jersey City to draw upon those markets for fresh cattle, and so long as cows from infected herds could be sold cheaply at the last named places there was every temptation to sell them to go to the more southern cities at a sound price.

The state of things along the Erie Railway is the exact opposite of this. From the New Jersey line westward, there is no large city for the space of about 200 miles, and consequently none of the open, unfenced grounds on which the herds of different owners could mingle. The valuable land is safely fenced so that if by accident the contagious germ were introduced, it made a steady progress through all the susceptible members of the herd, and then expired for lack of susceptible subjects. If by chance a poor man could pasture his sole cow on a wild and unfenced mountain side, it was so far removed from others that, even if infected, there was little chance of the propagation of disease to others, and the contagion soon extinguished itself in death or recovery. More potent still in its protective influence was the fact that the cost of cattle on the west of the Alleghany mountains was much less than on the seaboard in the vicinity of the large cities. No one, therefore, along this line of rail went to New York or Jersey City to purchase common cattle, and along the Erie line the supplies of fresh animals of common breed came all from the West. It was high-bred cattle only that were conveyed from New York and the seaboard to replenish the inland herds, but these were placed on the farms of wealthy owners, which were carefully fenced, and where every precaution was taken to prevent intermingling with adjacent stock. Thus it was that infection, though it had been carried westward, would still have had a better opportunity to die out in the secluded herd, which was first infected, than it had around the Eastern cities. Had it been at any time conveyed into the herds of poor milkmen who pastured their cows on the unfenced commons of the Western cities, or had it been implanted on the open cattle ranges of the West and South, its perpetuation would have been as certain as around the cities on the seaboard.

Along the line of the New York Central Railroad the conditions are equally unfavorable to the propagation and permanence of this plague. North of Yonkers, where the open commons virtually end, the land is mostly well fenced, so that the

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infection, though introduced, had every opportunity to die out and find chances of preservation.

On the Harlem Railroad there is a similar comparative absence of large cities and open common pastures. This is especially the case north of Mount Vernon, and up to this place the plague has long prevailed more or less, continuously. The introduction of the Lung Plague into different places in Westchester and Putnam counties was usually easily traceable to cattle brought from New York City; and as the infected herds were all on unfenced farms, the pestilence was easily stamped out.

The conditions along the New Haven Railroad were somewhat less favorable, but the State Cattle Commissioners of Connecticut were ever alert to the danger and nipped in the bud every centre of imported infection.

THE DISEASE SHOULD BE ERADICATED.

The lessons of the above history are manifold :—

THE AFFECTION CAUSED BY INFECTION ONLY.—STAMPING OUT POSSIBLE.

1st. The Lung Plague is unknown at least out of Eastern Europe and Asia save as the result of contagion. Wherever it exists to-day its advent can be traced in the importation of infected animals. This applies alike to the countries of Western Europe, Great Britain, and Ireland, the United States, South Africa and Australia. Where it has not been so introduced by the importation of infected animals the infection is still unknown. This applies to Spain and Portugal, the Channel Islands, the Scottish Highlands, Iceland, Newfoundland, Canada, New England, all our Northern, Western, and Southern States, Mexico, Central America, the West Indies and the whole of South America. Wherever it has been introduced into a new country, but thereafter vigorously suppressed, until completely exterminated, the soundness thus secured has continued in every case unimpaired to the present time or until a reimportation of the malady. Of this we have examples in Norway, Sweden, Denmark, Holstein, Frisland, Oldenburg, Mecklenburg-Schwerin, Switzerland, Massachusetts and Connecticut.

Results like these so uniformly the same in all times and in all parts of the world, at least in all out of Eastern Europe and Central Asia, show most conclusively that this malady is propagated by contagion only, and that no country need fear its development nor prevalence unless it is introduced from another land that has been previously infected. They show further, and beyond all dispute, that if any infected country out of the centre of the Eastern Continent shall thoroughly eradicate the infection now existing, it need fear no future outbreak of the pestilence so long as it shall guard itself against the reinfection by a renewed importation of the plague from abroad.

RESTRICTIONS ON TRAFFIC IN INFECTED DISTRICTS—ON PASTURAGES.

2d. The conditions of its permanence and widespread prevalence in any country are the constant mingling of cattle from different herds, whether because of the nature of the cattle traffic, or the system of pasturage.

Of the effects of the cattle trade we have the most striking example in the constant infection of European lands (Austria, Germany, Holland, Belgium, France), in the direct line of the cattle traffic from the stock-raising Steppes in the East, whereas those to the north and south of this line (Norway, Sweden, Denmark, Spain and Portugal) have maintained a continuous immunity. The constant infection of England since 1842 is no less conclusive in this respect. Great Britain has been justly

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called the workshop of the world; and as the flocks and herds of England can supply but a small portion of the demands of her great army of artisans, cattle are drawn by her more than by any other nation from Central and Eastern Europe, and as year by year the facilities for rapid railway travel increase and extend, in the same ratio extends the danger of a constant influx of the Steppe plagues of animals. It will be remembered that with the one single exception of the importation of the disease into Cork, Ireland, the British Isles were protected from this and other animal plagues until in 1842 the Free Trade Act brought the great influx of European cattle and sheep. It will be noticed further that the extraordinary development of English manufacturing industries since that date has produced a steadily increasing demand for foreign live stock, and that the supply of this demand has kept the fair fields of England in a state of chronic infection. It will be noted, on the other hand, that since the inauguration, several years ago, of the slaughter of European cattle at the ports of entry into England, her cattle plagues have been far more circumscribed than heretofore, and it may be confidently affirmed that if this were supplemented by the necessary restriction of intercourse among the herds of native cattle, by the slaughter of the sick and the disinfection of the premises, the bovine plagues would speedily disappear from the land.

The inference for our own guidance is that no measures for the suppression and extinction of the Bovine Lung Plague can ever be universally and permanently successful that do not include such an absolute control of the movement of animals in infected districts as shall insure that no germs shall be carried from such districts to the outer world to prove new starting points for the plague. In such districts it is inevitable that stock owners must be subjected to the greatest inconvenience. All *public* markets must be temporarily abolished. Such markets as are allowed must be for animals from districts known to be sound, and from such alone; they must be conveyed to market by such channels and under such supervision as shall prevent their infection on the way. And they must be sent from the market under permit and with all needful precautions to their destination. Movements of animals between herds in the infected areas can be allowed only after the examination of the entire herd, and a guarantee of soundness for at least three months previously, based on a series of professional examinations covering that time. Or, what is much better, all movement from a herd in the infected area should be forbidden save to immediate slaughter. In keeping with this it must be insisted upon that no dealer shall be allowed to keep herds of cattle for sale in the infected area. Where that area is small dealers can establish their sale herds in an adjacent district, where the purchasers from the infected district can go, and whence the cattle can be sent directly to the herd of the buyer inside that district. Where the infected area is large, or where the conditions are such that this is impossible, the markets for store cattle should be made bonded yards or buildings where dealers can keep their stock drawn from sound districts, but from which they cannot remove them save to immediate slaughter. In case of sale such cattle should be removed by the buyer on permit to his own herd only.

To those unacquainted with the nature of this disease, the above restrictions seem unnecessarily and absurdly stringent. But the following considerations will show that they are absolutely essential to success:

Long Incubation.

a. The Bovine Lung Plague has a period of incubation extending in some cases to three months and a half (104 days). This long incubation was fulfilled in the Ayrshires that infected Norway, the Shorthorns that infected Australia, the Dutch bull that infected South Africa, and in a cow that carried the infection with her to the east end of Long Island, April 28th, 1879, and was observed to be ill August 10th. During all this period the most skillful expert will fail to detect the slightest

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indication of ill health, and in such a case the examination of the individual animal can give no guarantee whatever. Even a careful examination of the entire herd may reveal nothing though the seeds of the plague are present, and it is only a series of examinations of the entire herd extending over the period of the longest incubation (90 to 112 days) that can give an assurance of safety. The owner of the herd infected with this plague is subjected to the constant temptation to turn off, at a fair sound price, animals that he knows will almost certainly fall victims to the pestilence and by the long period of incubation after the animal has taken in the germs of the disease, and during which no sign of their presence can be detected, he is furnished with the amplest opportunity to make such sale without suspicion. While there are many who would scorn to take advantage of such an opportunity, every community contains many who would be only too easily overcome, and it is a sound principle in government that seeks to preserve the weak by removing the temptation. But if the temptation is great for the stock owner, it is even more so for the dealer. His training to buy in the cheapest market and sell in the dearest, places the bait in exact parallelism with his daily habits of mind, and with him it requires a special effort to shut his eyes to the advantage and to turn his attention to less remunerative trade. Moreover, he is specially exempt from the risk of suspicion of evil designs; none can charge back upon him that he knew all the circumstances of the case, for did he not risk his own money in the purchase, and would he have imperilled that and his own reputation in knowingly possessing himself of unsound stock. He can argue that had the cattle been from his own herd, and had the existence of infection been known to him, he would have declined to dispose of them, but that he is not to be held responsible for the action of another who has wronged him in imposing upon him worthless and noxious animals.

Encysted Masses in the Apparently Recovered.

b. Cattle that have apparently recovered from the Lung Plague too often carry in their chests dead and encysted masses of diseased lung, which are really masses of infecting material, and it is often six, eight or twelve months before these are entirely liquefied and removed. Such animals may look well, feed well, milk well, and even gain flesh, and are yet exceedingly dangerous if placed in sound herds. From such herds sales are likely to be made with the most upright intentions. It has been, perhaps, six months since any sickness has been shown, and the owner naturally concludes that all the survivors have fully recovered and that they may be disposed of with perfect safety. But the animal with an encysted mass in the chest, which has proved harmless in a herd which has passed through the disease and acquired an immunity for itself, is not always innocuous to sound and susceptible cattle, and we have repeatedly seen instances of such animals proving the centres of new outbreaks in hitherto sound herds and districts. To guard against such evil consequences it becomes absolutely necessary to stop all movement of cattle save under the conditions mentioned, and above all to stop all markets and miscellaneous congregations of cattle, and to abolish all sale (dealer's) stables save the bonded inspection yards within the infected area.

DANGER OF INFECTION OF THE WEST.

3d. The greatest danger in connection with this disease is that of its transmission to our Western stock raising districts. This is liable to occur any day in connection with the shipment of a thoroughbred sire to those plains for the improvement of the native stock. The danger of this increases daily, in proportion to the increase of the infected area in the East, of the number of thoroughbred herds in the infected districts capable of furnishing such sires; of the extent of railroad, and the number-

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of cars used for moving (infected) cattle in that area; of the number of infected herds in such districts living in barns with hay that may be afterwards sold to supply food for such thoroughbreds on their passage west, and of the number of attendants on sick cattle in the East, who may any day pack their infected clothing and start out west only to seek employment in tending other herds, and to convey the infection to cattle on the plains. The infection will cling to a building for three months; how much more will it cling to clothing that is closely packed in a box for three days! It is a recognized principle that the more closely a virus is secluded from the air the more certainly is its virulence preserved. Hence, in preserving vaccine matter, we enclose it in hermetically sealed tubes, or if preserved on ivory points they are closely wrapped up in sheet lead. Typhoid fever poison is preserved and even intensified when confined in unventilated sewers, cess-pools and privy vaults, whereas it is soon rendered harmless by the action of the air. Yellow fever is often communicated through the impure products in the almost hermetically sealed holds of ships, and attacks the hands employed in unloading, though the sailors who have slept in the partially ventilated cabins and forecastle have entirely escaped. Typhus has long been known as the fever of close, foul and unventilated jails. Measles and Scarlatina is often confined to a single member of a family living in spacious rooms, into which the air is freely admitted, but attacks all susceptible subjects in small, low-roofed, close, unventilated apartments. Smallpox virus is preserved indefinitely in closely packed clothing, and even in graves, but is quickly disinfected in the free air. Tuberculosis is so likely to become general in close, ill-ventilated dwellings, that it has been attributed by many to rebreathed air. Pasteur has shown that chicken cholera virus increases its virulence as it is cultivated in a limited amount of air, and becomes finally harmless if cultivated in free air. Buchner has reached the same conclusion in the case of Bacteridian Anthrax (Bloody Murrain).

My experiments on Hog Cholera have shown a very high mortality, if the virus used for innoculation had been kept partially secluded from air, but a reduced virulence and fatality according as air had been freely admitted to the culture liquids. Even in the innoculated Lung Plague itself the results vary according as the virus has been used fresh from the diseased lung, or kept for some time in closely sealed bottles or hermetically closed tubes. In the latter case the swelling is liable to be unusually extensive and multiple, and fatal results are far more common. It should be added that recent research is claimed to have detected, in the Lung Plague blood and exudations, the spherical germs described a quarter of a century ago by Dr. Wilhems, the originator of innoculation. The presence of such a *microphyte* would assimilate this to the other Bacteridian diseases—Chicken Cholera, Bacteridian Anthrax, and Bacteridian Swine Plague, and would *a priori* imply the great danger of shutting up the virus in any tightly closed space and of thereby preserving it. The clothes of cattle attendants saturated with the virulent products and packed in a trunk for conveyance elsewhere would afford one of the most promising methods of conveying the infection to a distance.

The danger of the propagation of this plague to the Western States has been unspeakably increased in the course of the past year, by the shipment of calves and yearlings from our Eastern Dairies to the markets of Chicago, Kansas City, &c., for distribution in the adjacent States. In our Eastern Dairies the calf is usually considered a source of loss by reason of its consumption of valuable milk. The slaughter (Deaconing) of the calf has therefore been long and extensively practiced. Now, however, it has been discovered that such calves may be profitably raised in the West to consume the rich vegetation of the Mississippi Valley, and that the animal bought for little more than the price of its hide can be returned to the East in three years worth $60 to $80. This offers a valuable source of revenue to the West, and accordingly

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this trade in its first year (1880) is alleged to have amounted to from 40,000 to 50,000 head. In view of the heavy losses from severe winter, the Western dealers in this class of stock are anxiously urging renewed shipments in the present year, and unless absolutely prohibited there is reason to fear the trade during the coming season will far exceed that of a year ago. While our shipments of cattle from the seaboard to the Western States was confined to thoroughbred stock there was some seeming guarantee of protection in the special care given to this class of animal, but with the newly started traffic in common stock even this slender support fails us and we must realize the presence of a peril which is at once imminent and overwhelming. Calves are of less value in the milk dairies of the Eastern cities than in the country, and the freight to the West is also lower from the first named points, so that the criminal negligence of our legislators has invited an evil which cannot well be exaggerated.

WESTERN INFECTION EQUAL TO GENERAL INFECTION.

4th. The infection of our great cattle-raising district west of the Mississippi will entail the permanent infection of the entire country. Let the infection be once conveyed to Texas or the Plains and it will speedily spread over all those great unfenced territories as it has done in similar conditions in all parts of the world—in Asia, Europe, South Africa and Australia. Even around our large Eastern cities the disease has been mainly preserved for thirty-six years by reason of the promiscuous pasturage of the dairy cows on the unbuilt lots and unfenced commons around those cities. These have repeated on a small scale the historic experience of the different countries named on their comparatively boundless open pastures. Often has this affection been carried out to agricultural districts, where the cattle were kept in inclosed pastures at a great distance from all other animals, and as often have such outbreaks died out spontaneously when all the stock had been infected, the subsidence having been simply from lack of fresh and susceptible subjects. Even around our large infected cities the plague is always more extensively prevalent at the end of Summer, after the yearly mingling on the open pastures, than at the end of Winter, when they have been long secluded in separate buildings. Such a fact shows forcibly the immense influence of this one cause in perpetuating and diffusing the infection. It is further notorious that this plague has made the greatest headway southward, through New Jersey, Pennsylvania, Maryland and Virginia, or in other words it has extended where it could find numbers of small towns surrounded by open commons, or unbuilt lots, where the cattle of different herds are accustomed to mingle freely.

INFECTION OF THE PLAINS IRREMEDIABLE.

5th. No attempts to eradicate the pestilence can prove satisfactory so long as the cows of such cities are allowed to graze promiscuously on the commons referred to. Our experience on this point in New York has been most instructive. In New York City, where, with the assistance of the Police Commissioners, a sound pasturage law was enforced, the disease was definitely extinguished, whereas in Brooklyn, where the ill-advised Aldermen and Magistrates acted in a manner most inimical to the maintenance of such a law, it was found that the slaughter of the sick and the disinfection of the premises was utterly inadequate to stamp out the pestilence. In New Jersey, too, where General Sterling was unable to enforce a sound pasturage law, but where, around the infected cities the cattle of different owners continued to mingle on the commons no such effective work has been accomplished as was done by us in New York City, Suffolk, Queens and Putnam, in which such a law was rigidly enforced. These are but repetitions of the experience of centuries in Europe, where, in the absence of war or some other disturbing influence, the Lung Plague was mainly confined to the open Steppes in the East and the unfenced mountains in Central and Western Europe. In

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these it continued without intermission, ready to be spread widely over the plains whenever the Steppe or mountain herds were rushed off into the commissariat parks of belligerent armies.

Let our sanitarians, our stockmen, our city magnates and our legislators learn from the experience in all past time, of Europe and Asia, of Africa and Australia, and no less of our own Eastern cities and suburbs, that there can be no success in dealing with this disease so long as the cattle of different owners are allowed to pasture in common in infected districts. Cattle Plague Commissions may be maintained, thousands of cattle may be killed, disinfection of buildings may be thorough, money may be poured out like water—but without a separate, fenced pasturage for each herd it will be necessary to kill every head of each infected dairy in order to stamp out the scourge. Around the city the movement of cattle may be stopped and the plague exterminated, but in the open Plains no such restriction is possible, and infection must become general and permanent.

INFECTION OF THE PLAINS WILL ENTAIL THAT OF THE PACIFIC COAST.

6th. The infection of our unfenced cattle ranges in the West means the universal infection of the United States. From those Plains cattle are sent for the supply of the mining cities in the Rocky Mountains and the Sierras, so that the infection would be carried onward until it should reach the shores of the Pacific. Texas and the Plains are also at the source of our Eastern cattle traffic, and if infected would speedily permeate all its devious channels, and scatter the plague over the whole of the Middle and Eastern States.

Should this time ever arrive, we shall be reduced to a worse condition than Europe, and shall suffer proportionally more. The great infected Steppes are at the source of the cattle traffic of Europe, as our Plains are at the source of ours. But the Tartar does not simply raise his cattle for beef as do our Western stock-raisers. In the Steppes the nomadic owner lives on the milk, cheese and meat of his herds, and drinks the *Koumis* made from the milk, but he is under no necessity of sending his surplus cattle to the markets of Western Europe. Again, the western frontier of Russia is patrolled day and night by a numerous guard of gendarmerie whose duty it is to compel all cattle to cross at the quarantine stations only, where they may be subjected to detention and examination. On our Plains, on the other hand, cattle are raised for beef only, and if they cannot be sent to the Eastern market the trade must be ruined.

In the second place, our Western graziers have virtually a monopoly of this business, and the vast proportions of the cattle traffic towards the East would render all attempts at detention and examination utterly useless. With the arrival of three thousand cattle at one point (Buffalo), daily, a detention of one week would lead to the aggregation of twenty thousand head, and upward, constantly. If the same were attempted for three months, the shortest time that would give any reasonable measure of protection, the accumulated cattle would amount up to 27,000. Add to this, that every herd of these must be kept sufficiently far apart from any other to obviate the danger of contagion through the air, as otherwise their quarantine could never be safely ended, and you have a series of obstacles that must show the utter impracticability of any such measure. No! infection of our grazing districts means the permanent infection of the entire United States, and as we are in danger of this from every day and every hour of delay in stamping out the scourge, it is well to note what would be the pecuniary result.

PROSPECTIVE LOSSES FROM GENERAL INFECTION.

Great Britian, with 6,000,000 head of cattle, has lost $10,000,000 per annum from this plague, though the great cattle raising district of the Highlands escaped. We,

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with our 37,000,000 cannot therefore hope to lose less than $65,000,000 yearly. To-day the United States Government may obviate such a terrible consequence by the well directed expenditure of $2,000,000. Let her neglect it, and she must soon see her fair territory, naturally so salubrious, ravaged by a foreign plague, the losses from which will represent a debt of $1,300,000,000, with no prospect of abatement, but of a steady increase as the continent shall become more densely peopled.

To neglect such a matter is one of the gravest crimes; to let it await the leisure of legislators is the most foolhardy temerity; to let it become the football of political quibblers and theorists is the most consummate folly; to place its administration in the hands of political favorites or incompetent and half-hearted authorities is likely to prove an irredeemable blunder; and to deny to an Executive charged with the extermination of the plague sufficient means to make its work effectual, or sufficient power to overstep State boundaries in dealing with infected animals and in punishing offenders, is but to prolong the pestilence, to increase the final outlay, and to woo the infection of the Plains and the permanent establishment of the scourge.

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THE FOREIGN CATTLE TRADE OF THE UNITED STATES.

ITS OUTLOOK AND WANTS.

BY

COL. ROBERT BEVERLEY,

OF THE PLAINS, FAUQUIER COUNTY, VIRGINIA.

Because of the great value of the Live Stock and Beef Trade from the United States to England, I venture to write on this subject. I graze and fatten for market about 600 of the best grade Short Horns to be found in Virginia, and in 1880 bought and shipped abroad, including my own 600, about 3,000 cattle. All but two small cargoes of these were from the Port of Baltimore; those two cargoes from New York. All the shipments up to 1st October were profitable; after that insurance became so high that all the profits were consumed by it, till, about December 1st, insurance became prohibitory, in my judgment, having risen from three per cent. in May, June, July and August to fifteen per cent. in December, and no risks taken in the United States at any rate; they were only obtainable in England or Germany. My last shipment was made by the "Thanemore" from Baltimore, the 28th November, and I believe all made since, of *Live Stock*. have made a heavy loss to the shipper, but, I suppose, a profit to the *dead meat* shipper, who has a comparatively nominal insurance to pay—no feed bill, no attendants' hire, less freight, and a very cold winter to land and distribute it. Just here I will say, I have no experience in the "Dead Meat" trade, but believe it might pay well from November to April, but very hazardous the other seven months. As to the Live Stock trade I propose to write; and I do not believe it can be successfully prosecuted under the present restrictions. 1st. Restrictions on the other side, confining us to the port of entry for the sale of our Live Stock. 2d. Admitting Canada cattle, which come mostly from the United States, free of that restriction. 3d. High rate of freight. 4th. Innumerable charges on the other side. 5th. The almost prohibitory rate of insurance.

First.—The restrictions are based on the pretense that disease among cattle is *broadcast* in our land, which I know is not the case, but is used by the Privy Council, representing the stock-raising interest in England to prevent our beef coming in competition with theirs. There are but two forms of contagious disease among cattle in the United States—one, Pleuro-Pneumonia; the other, Texas Fever. The former was imported from England and Germany, is not inherent to our climate or soil, cannot successfully *home* among us apart from our crowded dairies in and around our cities, is now confined to the cities of New York, Brooklyn, Philadelphia, Baitimore, and the adjacent counties; not a case of it west of the Alleghany Mountains or south of the Potomac River. Is it not a crying shame that this great Government at Washington don't take immediate meads to eradicate this disease, so easily effected, now in its small proportions? I believe they will do it, and would have done it a year ago but for the opposition of a Mr. Covert of Brooklyn or New York, having a district partly in both, being made Chairman of our Agricultural Committee by the *eminent agriculturalist* Mr. Sam Randall. This Mr. Covert always makes a minority report in opposition to anything

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emanating from the Agricultural Committee, and the Congress of the United States being composed of about 200 lawyers, only 57 farmers, the balance engaged in all other pursuits, of course a bill in aid of agriculture opposed by the Chairman of the Committee has a feeble chance of success. While I know this disease in its present small proportions ought to be, and I believe will be, speedily eradicated from our land, yet the chances of transmitting it to Europe are not one in ten thousand, for every animal exported to Europe comes from sections far beyond the slightly infected district, and do not stop long enough at the ports of shipment to take the disease were it broadcast there, and I do not believe a single case of contagious Pleuro-Pneumonia has ever reached the shores of England from this country, but that ordinary Pneumonia, contracted from great exposure on the cars and shipboard in extreme winter weather, by cattle just out of warm distilleries, have been reported to the Privy Council as *contagious Pleuro-Pneumonia*, for the purpose of excluding our beef from coming in competition with theirs. The only case cited with any degree of confidence, and on which the Privy Council issued the prohibitory order, was the cargo of the "Ontario," shipped in the Winter of '79 from Portland, which cattle were taken by rail, partly from their Dominion of Canada and partly from Buffalo, New York, (still-fed cattle) and were "snowed up" several days on the cars, and were exposed on the deck of the ship to an extremely cold voyage, and, though they left Portland with a clean bill of health, when they got over they were condemned with contagious Pleuro Pneumonia. It is certain there never was a case of Pleuro-Pneumonia in Buffalo before or since that date, and hence we believe this condemnation was erroneous.

As to Texas Fever, I have some knowledge of it, and it does exist, or we are liable to it in the United States under certain contingencies; but it is entirely eradicated by *frost*—hence latitudes north of 38 are not liable to it in the Winter time. My experience. In 1866, after the war, the live stock in Virginia being almost exterminated, I went to Texas and brought from there into Virginia 700 cattle. When started in October they were covered with Texas ticks; in Arkansas, a very cold spell striking them, most of the ticks fell off; when they reached Memphis they had but few on them. There we put them on the cars; when we reached Virginia, about the middle of November, it was very cold and all of the ticks had disappeared. Those cattle were distributed through many farms in Fauquier and Loudon Counties, Virginia, and no disease followed them. Let me say here, Texas Fever is never fatal to Texas cattle, but to the native cattle that follow them or graze on the ground they have been. The next year, *in May* (my importation having been successful), a Mr. Eddings brought in 800 Texan cattle *covered* with ticks, and though *they* did well, all the native cattle that followed them either in *road or pasture*, though six weeks or two months after, died of Texas Fever. Our people not understanding it, induced Mr. E. to bring in another lot of Texas cattle the following May, and it proved with like results. As I had felt no bad results from my importation in November, I thought they were safe property in May, and I bought a few of E., but in about two months my *native* cattle running on the same ground took sick and some died; after careful thought I believed it to be the effect of the tick. I took up my native cattle and found them full of ticks; by scrubbing them well with carbolic soap, with corn cobs, rubbing the ticks off, I saved 5 out of the 8 thus treated, and soon thereafter, frost coming on, stopped the disease. I now believe the Texas Fever is a blood poison, inserted by the Texas tick, which, when fully infused in the system, is incurable, and that there is no danger from it after hard frost, as I venture to say that there is no case on record of it in high latitudes in *Winter time*. I have been frequently asked why does it not kill the Texas cattle? I reply that nature has provided them with a thick hide (the tanners will tell you, twice as thick as the native cattle) to protect them against this and other insects native to their climate. I have watched the stages of this insect, and when they get

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as large as the end of your thumb, double the size of a dog tick, they drop off in the cars, road or grass, and one big tick will soon hatch out a thousand and get on the cattle following. What is the remedy? Restrict Texas or Southern cattle to their own latitude till after hard frosts, then there is no danger. Virginia has passed such prohibitory laws, and we have had no such disease for several years. I should think that Texas cattle shipped from the ports of New Orleans or Galveston at any season of the year to Europe, might carry the disease, because the temperature is rarely low enough there to destroy the insect on a warm animal; but north of latitude 39 there is no danger from an animal shipped in November, December, January, February or March. If these views are correct, it is folly to talk about State's rights and continue successfully the live stock cattle trade to England; that government will and should keep up its restrictions. The Federal Government should be clothed with the power to stamp out Pleuro-Pneumonia wherever found, and prohibit the passage of Texas cattle into or through the States north of latitude 39 except in frosty months. Inspection at the ports of shipment is not sufficient, for both Pleuro-Pneumonia and Texas Fever may have been contracted by the cattle, and no veterinary on earth can detect it, and yet it will be developed in a 12 days' passage.

Canada is a successful competitor for the trade, because cattle from the United States are passed into it in the Summer and Fall, fed there on imported grain and oil cake; in a word, quarantined and exported to England in March, April and May, free of all restrictions. The exportations of cattle from Canada in 1880 reached near 55,000 head, the arable portions of it being not larger than Pennsylvania and Virginia, which States, together, did not export 10,000 cattle in the same time.

FREIGHTS.—They are exorbitant. A deck-load of 150 cattle on a 2,500 ton steamer, paying £4 per head, or $3,000 for room that could not be, and has not been generally, utilized for any other freight. The vessel is at no cost except the fittings and water supply obtained by condensing sea water, both of which does not cost £1 or $5 per head, being a net profit to the vessel of $2,250 for room that could not be otherwise utilized. There is no liability to vessel for being washed overboard or *cast* overboard to lighten ship of deck-load—that risk is charged to shipper by the insurance companies. Then under-decks or between-decks there is no danger of being washed overboard and less danger of being *cast* overboard, yet imminent danger from suffocation in "battening down hatches" in a storm, which excludes the air on most ships and suffocates the cattle. Very few, if any, ships are sufficiently *ventilated with* "*down-hatches*" to save cattle in a long storm "between-decks." While insurance is enormous to the shipper, almost prohibitory, in the shipment of "Live Stock;" yet on steamers, as at present constructed as to ventilation, I do not think the insurance companies can make any money. On deck, in the Winter season of storms, it is very risky, and between-decks with present ventilation it is more so, and I can't see why they can't be as perfectly ventilated as the cabin of a passenger steamer and as safe, and as they charge fully as much freight when you deduct the *board bill and attendance* and *luxurious equipments*, I am sure the cattle trade equally ventilated would pay the ship owners equally well, and reduce the insurance to about 3 per cent., which the shipper might afford to pay. The live stock shipping business is in its incipiency, and I feel sure will soon be perfected as to freights and insurance, but at present the two combined are almost prohibitory to the trade. Expenses on the other side amount to about $5 per head; this includes commission, which will regulate itself as there is competition for the trade; but the "dock fees," "lairage," "watching attendants," &c., are additional restrictions on the trade and are very high. To sum up the above remarks, our Government should at once take means to stamp out the few vestiges of contagious diseases there are in this country, and then demand the free admission of our cattle into England, and freight should be reduced to about £2 10s. or $12 per head, and steamers should be so venti-

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lated that cattle can be carried between-decks without danger of suffocation; then insurance would be reasonable, or the shipper could take the risk himself. With these improvements the other impediments to the trade would disappear and a very large business could be done in live stock shipments to England, France and Germany. The supply of cattle in this country is ample, the price here is low enough, but the cost and charges of shipping are enormous, aggregating about $40 per head on an animal that costs $70 on shipboard, and a smaller and more inferior animal would be consumed entirely in expense. There is no product that I know of in the United States that will bear the expenses of more than half its value to export it, hence I think these restrictions must be removed and charges reduced before the live stock trade to Europe will assume any larger proportions. The effect of restrictions in England to the port of entry means that the cattle are to be slaughtered at that port within ten days after arrival, thus putting it in the power of butchers, when the arrivals are heavy, to buy them at their own prices, while Canadian and Spanish cattle can be driven to any market in the Kingdom—and it always makes a difference of a penny on two cents a pound in favor of the latter stock, which is equal to $16 per head, an enormous profit to them or loss to us. The average expenses of shipping are fully $12 too high, which, together with the restrictions, makes a difference of $28 a head against the grower and shipper of United States cattle.

I think the "dead meat" trade can and will be successfully prosecuted in the Winter season, but however perfect they may make their refrigerating vessels, there will be great risk in hot summer weather in distributing the meat after landing.

ROBT. BEVERLEY.

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IMMIGRATION AND EMIGRATION.

BY

N S. BAILEY,

OF NEW YORK.

Immigration from foreign countries and emigration from the Atlantic States to the West, Northwest and Southwest, have, within the last half a century, by the noblest Industry of man, spread a prosperous civilization over an area of nearly 4,000,000 square miles.

At first, the migratory numbers were few, and to "Go West" was a journey of but from four hundred to six hundred miles, as far as Western New York or Western Pennsylvania, or into Ohio, which was accomplished with the traditional covered wagon, drawn by one or more yokes of oxen, carrying the family and worldly goods of the hardy pioneer. As Ohio filled up, adventurous spirits pushed further on, and Indiana, Illinois, and successively one after another of the trans-Mississippi Territories were rapidly populated and converted into States, until, at last, a Western limit was reached; the shores of the Pacific Ocean settling the question of further expansion in that direction.

While the early settlers devoted themselves to tilling the ground, Capital and Enterprise were quick to comprehend the probabilities of the future, and nearly a hundred thousand miles of railways have been constructed and projected, to provide necessary and economical transportation in every section of the Union. The iron horse now goes bounding over the measureless prairies, the sandy plains, through the deep valleys and over the great mountain chains, without break from the Atlantic to the Pacific. Navigable rivers and the telegraph make the system of intercommunication complete.

During the last century there have arrived in the United States, about 10,000,000 of immigrants, of which number the decade ending June 30th, 1880, contributed 2,812,177. The last year of the decade brought 457,243, which exceeded the arrivals of 1873 by 6,440, the numbers for these two years being largely in excess of any other year.

It is interesting to observe, that during the decade no less than 485,025 immigrants entered this country at the various lake ports from Canada. From the year 1870 to 1878, the number entering from Canada was 341,107. Allowing the number claimed by Canadian statistics, as "emigrant passengers to the United States via Canada," for that period, which is 261,574, we still have the large number of 79,533 of immigrants from Canada to the United States; against a claim of 15,814 emigrants from the United States to Canada during the same period, and deducting a corresponding proportion for "emigrant passengers through the United States to Canada," about 75 per centum, we find less than 4,000 people, including women and children, emigrating from the United States to Canada during the years 1870 to 1878.

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There arrived at the Port of New York during the year 1880, according to the Annual Report of the Commissioners of Emigration :—

Adult males	178,462
Adult females	85,889
Children under 12	63,020
Total	327,371

PRINCIPAL NATIONALITIES.

England	33,768	Italy	11,190
Ireland	66,399	Greece	40
Scotland	9,625	Spain	261
Wales	3,588	Portugal	54
Germany	104,264	Russia	7,698
Austria	4,461	Luxemburg	511
Hungary	6,672	Bohemia	7,606
Sweden	35,217	Turkey	61
Norway	9,937	China	200
Denmark	5,577	British East Indies	48
Netherlands	3,259	Africa	45
Belgium	1,309	British America	588
Switzerland	8,223	West Indies	1,667
France	4,087	Mexico	216
Central America	107	Hawaiian Islands	44
South America	386		

The rules and regulations at Castle Garden for the care of emigrants seem as perfect as human wisdom and experience can devise; and when it is seen that over one thousand a day pass through the institution, some idea may be had of the efficiency of the management. The report of the Chief of the Bureau of Statistics (not yet published) will show the aggregate numbers arriving at the ports of the Union, which will largely augment the above figures.

In addition to the numerous class who have heretofore flocked to this country to seek occupation in the labor markets, we now find a more intelligent and educated class disposed to bring their energies, experience and capital here, and take up their abode with us. We find many of the tenant farmers of Great Britain desirous of coming to the United States, and cultivate their *own* farms, instead of those they can *never own*. We find manufacturers desirous of transplanting their works to this country, to avail themselves of our cheaper materials and abundant water power, and the current year will bring, according to the present indications, a larger number than ever before of foreign capitalists prospecting for investments.

There is room enough for all who may choose to come. We have 1,500,000,000 acres of virgin soil yet unsold, and ready to give forth its increase in response to the labor of the agriculturalist; we have hills and mountains of the richest ores awaiting the operations of the miner, and subterranean rivers of petroleum whose flow has never yet been attracted to the surface of the earth. The occupation and development of all these open up future possibilities for our country beyond the comprehension of many, especially of those who cannot realize the substantial advantages accruing to a State from an increase of its agricultural population.

Take, for example, one of the North-Western States, with almost the entire population made up of immigrants. When those lands belonged to the General Government or to the State they paid no revenue to either, but when sold to settlers the purchase money augmented the treasury funds; the property paid taxes to the State, and the improvements made by the settlers enhanced its taxable value from year to year. If a given number of inhabitants, occupying an area of but one-half of the State, with

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their agricultural and concomitant industries, were taxed eight mills for the support of the State, would not the rate be reduced if the other half of the State was also occupied and improved to a corresponding extent? The incentive offered, by a denser population, to capitalists to provide ample and cheap transportation facilities needs no discussion.

The field for the distribution of immigrants has recently been greatly enlarged. During the Slavery period, the Great South was but little studied, and little known outside of its territorial limits. The labor system in that section was exclusive and forbade any innovation; but when slavery was abolished and the mists of reconstruction cleared away, the sunny South asserted its claim to a share of the benefits of immigration. Many large estates are owned by the widows and heirs of the planters who lost their lives during and since the war; and few of the surviving owners of those immense plantations have the capital to cultivate them, and hence they divide their properties into small farms and offer them for sale. There are also hundreds of thousand of acres of original forests abounding in valuable timber; and nearly every Southern State is rich with minerals.

But the South is not known abroad. Climatic conditions have much to do with the direction of European emigration, and the peoples of Southern Europe, who are best adapted to settle in the Southern States, and cultivate the products with which they are familiar at home, speak a different language from ours, and are unable to read our newspapers and pamphlets which so profusely portray the advantages and facilities offered to settlers by the respective States, and therefore remain in ignorance.

Again, there are thousands of peasant farmers in the south of Europe, sober, honest, and industrious men, who have accumulated a few hundreds or thousands of dollars—enough to bring their families over to America and purchase a snug farm, in cultivating which they could soon make themselves and families independent. But when asked to go to one of the Southern States and settle, they hesitate, for fear of making a mistake to be discovered only when they have parted with their money, the savings of many years of toil. What do they know of the Southern States? Have they not heard that section decried for the past twenty years by those who were interested in urging them to go elsewhere?

While the Western States and the great Railway Companies have expended large sums in printing pamphlets in the Continental languages, and sending able and intelligent men to Europe to promote immigration to their particular sections, the Great South have done comparatively nothing to divert a portion of the stream to that section.

The solution of the problem is not difficult, and, if it is undertaken in a practical way, it need not be expensive, as we have for our guidance the experience, the efforts, the failures and the successes of those who have labored before us in this field.

That fair section of the Union may certainly claim much in its especial favor. It is an agricultural, a pastoral and a mineral country. To its own great variety of semi-tropical productions it may add everything which is grown in the North and West, and compete successfully with those sections in the quantity produced per acre. A ready market at remunerative prices is always at hand for the diversified products of the small farmer, in the Northern cities, and the world's commerce makes a constant demand for its great staples, which can only be produced in the Sunny South; whilst the rigors of winter, with its months of embargo upon farm labor, are there unknown. A man with small means certainly runs less risk in going South than in going West.

So long as the present unsatisfactory condition of the social, political and industrial affairs in Europe continues, immigration in vast and possibly increasing numbers will continue, and the United States will long remain the Mecca of the millions who will expatriate themselves to escape evils they can neither avert nor endure.

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The following, from a leading London paper, is seriously suggestive, indicating, as it does, the hopeless situation of the agriculturists of Great Britain. It is only when in despair the conservative press of England utters such language :—

From the London Economist.

"It may be from fear of America, it may be from the long continuance of unprofitable harvests, it may be from the rise in the expenditure, especially upon labor, or it may even be from increased intelligence, but there is a hopelessness about farmers' complaints which experienced men, familiar with their ways, never remember before. They hardly look for any improvement. They do not speak of the bad times as exceptional. They do not, among each other, talk of prices as sure to improve. Above all, they throw up their farms on apparently light provocation. Experienced land agents notice a total difference of tone, an indisposition to haggle, a sort of determination to make none but low offers, and to stick to them. The tenants, as they say, seem not to want the farms, and make offers too low to be entertained, in a kind of spiteful sport. Very often no offers at all can be obtained, and the land is either thrown upon the landlord's hands or goes out of cultivation. The latter occurrence was formerly most unusual in Great Britain, and seems almost impossible; but there is no reason to doubt the statements made that in every county in the south and east large numbers of farms formerly yielding good rents are lying idle, the landlords being unwilling to let at low rents to men who ask long leases, and unwilling to cultivate for themselves or able to bear a temporary loss. We know in our own experience of a district in which eleven farms, poorish to fair as to soil, are deserted and untilled, and have read advertisements of a quite extraordinary character in the way of temptation to tenants. Of farms in the landlord's hands, and of farms broken into two or three, there is no end, while land in modest patches has sunk in value in a degree which suggests a kind of dread among tenants as well as land buyers. There is a feeling of hopelessness, in fact, abroad among farmers of the better class, and of reluctance to remain in the business, which of itself may produce important effects, willingness to farm having been an important element in the trade. It differed from all others in its attraction for a class—those who preferred country life and were content not only with modest profits, but with almost an entire absence of those chances which in many walks of life are so attractive. Now that willingness has disappeared."

The distribution of the increasing numbers of immigrants who arrive without means to purchase a home for themselves, is becoming a most embarrassing question.

The cities and large manufacturing towns of the East are being overcrowded, and pauperism and distress abounds to an alarming extent, while in many sections a continual demand for laborers exists, which, if met, would relieve the cities and confer immense benefits on the country at large, as well as to those directly concerned.

As one method, and perhaps the most practicable one, I would recommend the establishment in New York of a "Labor Bureau" under the auspices of the American Agricultural Association, which, having its ramifications in every State and Territory, could supply laborers for farms, manufactories and public works, wherever needed; and there are many thousands of active and intelligent men of various nationalities now struggling desperately to obtain a living, who, if thus assisted to find employment in the West or South, would soon embrace the opportunities to acquire homes of their own, under the easy conditions offered by the Government and the great railway companies, to actual settlers.

Such a bureau could also be made a local agency for immigration, of the several States, and be supplied with the maps, reports and statistics, setting forth their especial characteristics and inducements, for the benefit of intending emigrants. The most reliable and unbiassed information could be given and parties directed to the responsible and authorized agents of the States to which they would go, who would facilitate their settlement and save them from imposition.

In this way much might be done to promote emigration and lessen the evils referred to, which now seem to be without a remedy.

N. S. BAILEY.

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CULTURE OF WATERMELONS.

BY

C. M. CLAY,

WHITE HALL, KY.

Of all the fruits of all climes, I most esteem the watermelon. At that season of the year, when low and malarious springs cause so much sickness, where cisterns are not made, the watermelon is sufficient drink, and exceedingly wholesome, acting on all the secretions, and keeping down tendencies to fever by gentle perspiration. But when the least decayed they are equally unhealthy. It is a tropical fruit, but may be raised in all climes where the Indian corn matures, and should be planted about the same time.

QUALITY.

The meat should be red, close, tender and sweet; the rind thin and brittle. Some of the large, coarse, thick-rind melons are good when in high culture, but they too often are second rate, when the meat becomes coarse, full of tendons and tough. They hybridize very easily, and but one variety had best be planted by any one; but if more are planted they should be many hundreds of yards apart, and then the bees and winds may mix the pollen.

SOIL.

I have given care to melons from my youth up, and have never succeeded in getting two first-rate crops from the same ground in succession. I have found the blue-grass sod, well turned under, the best soil for them; and next, newly cleared land, though they may be raised on any good corn land.

CULTURE.

At the first of May, in this latitude, the ground should be checked by the plow or other marker 10 feet by 10, or, with large varieties, 12 by 12 feet. If the proper land is used, no manure is needed; but, if old land or manure is used, the best is sand mixed with the vegetable debris of forests, or well-rotted sods taken from fence corners or highways. I have not found stable manures to answer well, nor have I tried guano or ground bones. In each cross of the lines a hill should be made, one foot deep and three feet square and four inches high, in which a dozen or more seeds should be planted, and then covered over with the same soil (a little sand mixed with it is better) two inches deep. The weeds, with light plowing, should be kept down through the season, never removing the vines from their place, as the roots run under the shade of the vine near the surface, and will perish with the sudden exposure to the sun. As soon as the seed are planted and struck with the shovel to compact the surface, in order to prevent the escape of moisture, I place shingles upon each hill to trap the

STRIPED BUG,

the great enemy of the vines. They seek the shelter of the shingles in the cool nights, when each evening and early morning they must be turned over and the bugs killed with a paddle. Many persons fail to raise melons because of these bugs, which

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conceal themselves in the ground and suck the juices of the young plants, and may never be even seen till the whole crop is destroyed. An old melon raiser told me that he was in the habit of making blazing fires in his melon grounds at night, and that the bugs would fall into the flames and be killed; I never tried it, finding the shingle trap sufficient. As soon as the plants are well up you may begin the thinning, till, as they get past the chances of destruction by the bugs and their leaves are well formed, they must be thinned to two plants in a hill. As the plants advance the weeds must be kept well under before the vines, but never touched behind them, as the vine will not admit of being handled or moved. I think nearly the same weight of fruit will be produced without topping or shortening the vines; but if large specimens are wanted, after the fruit is set the ends of the side shoots and the main runner may be pinched off, so as to force all the sap into the few melons left for maturity. It is best to cultivate the vines late in the afternoon, so that the roots injured by the cultivator, plow or hoe, can have the whole night to recover before the sun comes upon them.

WHEN RIPE

they should be gathered early in the morning, when cool, for the sun gives them the dull sound which maturity produces. They should be thumped lightly with the finger nail, when, if they sound with a metallic ring, seeming to pass through the whole melon, they are yet green; but if the sound is dull and seemingly confined to the rind, the melon is ripe. When the belly next the ground is white, or the curl of green fresh vines dead, these are also indications of ripeness. The stems should be cut long with a sharp knife and the melons placed in a cool place till eaten, when they should be cut through the long axis into equal halves, and each guest furnished with one-half and a silver spoon, so they may all have some of the best parts of the melon, which in a good ripe melon is the core.

KEEPING.

Melons may be kept well till November 1st in this latitude, in a cool cellar and on ice, very well till January 1st following. But I am in favor of eating all things only in their regular time, as the good Providence gives us some luxuries for all seasons.

SEED AND VARIETY.

The seed should be saved only from the best specimens, well ripened, and spread and cured in the shade, without washing; then put into bags and hung up in a place of moderate temperature till planting time. The best variety, after a lifetime of trial, I find, in this clime, to be what Gregory of Massachusetts calls the ice-cream watermelon —the same I have from other sources heard called a Persian melon—size medium, ovate, rind green; very thin and brittle; meat purplish red, solid, and very sweet and delicate; seed small and white. There is an old Kentucky variety called the Ice-rind, with the same qualities as the Persian; rind not so green, and seed brown; inclined to be longer, and meat not so deep a red. These are the best varieties I have ever tried, and I have tried tens of tens. The Mountain Sweet, Mountain Sprout and Jessamine Yellow seed, and other large varieties, are well for market, but not for epicures.

CAUTION.

As the frequent walking to the hills to kill the bugs solidifies the surface, it ought to be lightly hoed towards the end of this operation. No careless persons should be allowed to enter the melon grounds, as a vine trod upon ceases to be useful; and the one who gathers the fruit should have a long stick to steady himself, and to displace the leaves to find a place for the feet. It also often happens that the vines on clean surfaces find nothing to lay hold of with their tendrils, and are blown over by the winds and severely injured. In such case they should be uprighted, and clods placed on the leaves to steady them, or small sticks set near the vines for the tendrils to lay hold of. Avoid walking on the grounds when quite wet, and never hill up or reduce the height of the soil about the stems of the vines. Make a blind near the melons, and be seen there at times with a double-barrelled shot gun, but never shoot. C. M. CLAY.

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LAND AND AGRICULTURE IN ENGLAND.

BY

PROF. J. P. SHELDON,

OF SHEEN, ASHBOURNE, DERBYSHIRE, ENGLAND.

In England particularly, and also in Wales and Scotland, though to a less degree, there is, and long has been, a tendency for land to accumulate in the possession of fewer persons. In the time of the civil wars of two centuries ago not a few of the ancient feudal estates were confiscated and given to other persons. In most cases they were bestowed on the favorites of the successful competitor for monarchy for the time being; sometimes to foreigners, as in the case of the retainers who came over with William of Orange in 1688; but oftenest to successful warriors, courtiers, or minions of a king. The wiser of the English nobles were careful to add to their possessions out of the spoils of the prevailing anarchy of those times. Earlier still, a great deal of ecclesiastical property was taken away from the numerous abbeys, monasteries, nunneries, and the like, which were once numerous and wealthy in the land. The abbots and monks of old were disestablished and disendowed, and their property devoted to secular uses. This, however, was an act of spoliation which had become inevitable. It would be interesting to learn how many of the estates at present belonging to the nobility and gentry were at one time in the hands of the dignitaries of the church, and the grounds on which they were transferred to the ancestors of the present owners. In some instances these transfers have worn well through many generations, and various large estates have descended in a direct line from father to son for hundreds of years. In others they have changed from one family or name to another, by confiscation, marriage, or purchase. But in whatever way the great landed estates of England may have come into the possession of persons who are still represented by direct descendants, or otherwise, there has been, during the present century especially, a constantly increasing tendency for large estates to grow still larger. The laws of primogeniture and entail, anciently devised by the wealthy for the preservation of their estates, have served to prevent the squandering of patrimonies by reckless spendthrifts who now and again came into possession of them, otherwise many more large properties than has hitherto been the case would have been split up into smaller ones, according to ordinary enonomic rules. The more temperate of our large land-owning families have preserved their estates intact without difficulty, the younger sons being provided for in the army, the church, or in one or other of the many official or sinecure offices, the bestowal of which is among the sweets of State patronage. The less temperate ones have preserved them more or less intact with, at times, considerable difficulty, a wasteful scion of a family now and again reducing his successors to comparative poverty, during which the sequestered estate was redeeming itself. And in certain extremer instances the ancient patrimony has become so hopelessly involved that a sale of it, or of a portion of it, could not be avoided. Such are the practices which have operated in the possession of the great bulk of the land in England during a long period.

A small proportion of the soil of the country has all along been legally salable, and has more or less frequently changed hands during the period, a good portion of it

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having been annexed by purchase or otherwise to the existing and adjoining large estates. Land has rapidly increased in value during the present century, and particularly during the last, that is the third, quarter of it; and with the increase of value the desire to possess land has grown up and strengthened. Men of large and men of small means have alike become possessed of the infatuation, and the desire of the former has been commonly gratified, while that of the latter has not. A powerful social influence attaches in England to the possession of land, and for this reason wealthy men have preferred to have their capital, or a large portion of it, invested in the soil at 2½ or 3 per cent., rather than in some other commodity at 5 or 6. Merchants and manufacturers who have become wealthy through commerce have been commonly seized with the desire to become territorial lords, and to obtain for their families a standing, as it were, among the recognized gentry of the country; so they have bought up estates that were in the market, many of them impoverished by the recklessness of former owners, and as a rule have greatly improved them, adding alike to their beauty and productiveness. In these cases, and in those of old established families whose estates have been preserved from sequestration by the traditional wisdom and thrift of the successive owners, it has commonly happened that small adjoining properties have been eagerly purchased whenever they have come into the market. All this is quite natural and proper, wherever the ability to accomplish it exists. To round off an estate nicely by purchasing small properties which dip into it here and there, is an object which any land-owner may be excused for following, and those who, I think with great justice, clamor for free sale of land in England—that is, for the large estates to come into the market freely, when they are deeply involved—must also concede free purchase of it.

So far, however, the law of the land, as applied to the large entailed estates, has utterly prevented any such free sale, unless in extreme cases, and it has done so to the detriment of agriculture. Such laws do not exist in America, and what is here known as the "landlord class" is an exotic which at present has not began to flourish in the States, so that my trans-Atlantic readers will with difficulty understand how great a burden these privileges of the higher classes have imposed for generations on the agriculture of England. It may be well to investigate this question a little further, because it has a more or less direct bearing on a good deal of what I shall subsequently say in this article.

It is scarcely necessary to point out that a tenant-farmer class is a natural correlation of a landlord class, as we have the two of them in this country; and so it follows that the former cannot safely improve the land without the consent and co-operation of the latter. A farmer who is merely a tenant year by year of the land he farms—a system which is almost universal in England—cannot be expected to invest much capital in what are known as "permanent improvements," nor is he likely to increase the fertility of the soil beyond a point which promises to be directly remunerative to him. It is true that, in deference to the unwritten law of tenant-right, which is known as the "custom of the country," outgoing farmers have been reimbursed in part for improvements, of which they have not received sufficient benefit during the time they held the farms, but the arrangement has not been embodied in any legislative enactment, except the *permissive* Agricultural Holdings Act of 1875—an Act, by the way, out of which the great majority of English landlords contracted themselves, so that it stands as a law whose authority is annulled. The custom of the country, however, grew into a system, or into systems applicable in a special manner to special districts, so that its provisions were usually embodied in the forms of agreement which were duly executed between landlord and tenant at the commencement of a tenancy. These agreements have been much more favorable, or rather fair, to the tenant in some counties than in others, and wherever such has been the case agriculture has made

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greater progress. In less enlightened districts there are large tracts of comparatively infertile land which, though let at low rents as farms, have been little satisfactory either to owner or occupier, or to the nation at large; they seem to be under a ban, as it were, the ban of landlord's poverty and incapacity; and when once an estate falls into a state of stagnation in this manner, it is not easily extricated.

Yet it is not by any means always the present owner's or the occupier's fault that an estate is found in this condition. Perhaps the estate may never have emerged from its original unkempt state; or, having emerged, may have sunk into it again through the folly or poverty of its owners, long ago; or, indeed, it may be that a spendthrift ancestor of the present owner may have permanently burdened it to support his gross extravagance, or have involved it beyond redemption as the result of an unlucky speculation by which he had hoped to double his income. But, by whatever means these disordered estates may have come into this condition, it is hardly ever the fault of the present administrators, for an estate does not become so disordered in one generation. Instances may be found without difficulty where a limited owner—that is, an owner who has only a life interest in the property, and cannot sell an inch of it—a man who has succeeded to it from a line of ancestors who were in a similar state of legal helplessness, finds himself compelled to keep an entire neighborhood in a state of stagnation, while all around is progress and profit. He cannot afford to do anything to encourage his tenantry or to improve his estate, and they dare not do anything except "farm from hand to mouth," so to speak. Perhaps the estate is in the hands of the mortgagee, who would take advantage of tenants' improvements to raise the rents of the farms, in order to insure payment of the interest on the money he has advanced; or, it may be burdened with settlements on the younger children, or on a widowed mother, the owner's income from it being a mere nominal sum, which he seeks to enlarge by anticipating what would ultimately fall to him if only he could bide his time; this he can only do by mortgaging the future.

If we take, for example, a limited owner of 10,000 acres of such land, with a gross rental of £10,000, we commonly find a case of great hardships entailed. If the estate happens, as is often the case, to be situated in a district in which land sells to advantage for residential or other purposes, the owner might find great relief from present and future difficulties if he were allowed to sell, say 2,000 acres, which would probably fetch £100 an acre, or £200,000 in gross. By this method his income from land would be reduced to £8,000, but in the £200,000 at 4 per cent. he would have obtained an equivalent of £8,000 additional income. In any case he would be enabled to pay off jointures, settlements, and the like, leaving himself with an income equal to what it was before, dismissing his pressing burdens, and having a smaller and more compact, and consequently less expensive estate to keep in order. This, probably, is an extreme case, but there are such to be found; and while it is seldom under any circumstances that an estate yields an income of only 1 per cent. on the estimated capital, it is equally so that one yields more than 2½ to 3 per cent. It follows, then, that a landlord who receives by way of rental only some 2½ per cent. on his capital is a loser by 1½ per cent. on all the money he has had to borrow at 4 per cent. Take, again, another phase of the question. A limited owner of an estate worth £10,000 a year has to pay away one-fourth of his income in settlements on his sisters or his mother; this reduces his net income to £7,500. But how is it with him when a cycle of bad seasons comes, like the one from which it is to be hoped we are at length emerging, and he has to make a remission of rents to his suffering tenantry to the extent of 25 per cent.? Here the remission has to be made on the £10,000, for he has to pay the jointures in full, and so his income is further reduced by £2,500, leaving him with £5,000 only. There are, indeed, instances in England more extreme than this one, among limited owners; as, for instance, where an estate is involved to the extent of two-thirds or three-fourths

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the nominal income, in which event there is little or nothing left for the owner himself in times when remissions have to be made to the tenants on account of bad seasons.

It would seem to be reasonable that men in this position, owning land which yields them a return of 1 to 8 per cent., burdened with money borrowed at 4 per cent., should be allowed reasonable powers of sale. The necessity of this, indeed, is coming to be recognized, and it is probable there are few settlements made on land nowadays without equivalent powers of sale. The principle once admitted may with great benefit be extended. In the past, however, whatever it may do in the future, this question of limited ownership of land, disconnected from the ability to sell, has told heavily against the progress and development of agriculture in this country. It is easy to understand that a limited owner is apt to take a limited interest in adorning and improving his estate; that his chief interest lies in getting as much income as possible from land he can do nothing else with; and that the estate will be taxed to the utmost for the benefit of the younger children, who will have no part or parcel in it when their eldest brother comes into possession. This is the ordinary view which might be taken of such instances, but it must be said to the honor of the bulk of such owners that family pride has generally overruled the desire to make the most of a limited ownership, that the younger children have cheerfully acquiesced in the general self-denial which was necessary for the welfare of the estate, and that voluntary outlay in improvements has not been withheld on the part of the heads of families. This sort of thing is common among the small land-owners of France who farm their own few acres, but it is not so among the corresponding class in England—not, at all events, to the same degree and extent.

The Land Improvement Acts have been of great service to many indigent land-owners, and also to many others who, not indigent, have still been short of available ready cash for the needed improvements. Under these Acts a land-owner borrows money at a given rate of interest, which wipes off the principal too in a stipulated time; or he may borrow at a much smaller rate of interest, the principal being repayable according to agreement. The principle of repayment of the loan by annual instalments commends itself to any man who wishes at once to retain and improve his estates, the date of the improvements being coincident with that of the borrowing of the money. He borrows at a fixed rate of interest on security whose value is greatly augmented by the employment of the loan, and the accretion of value is his permanent reward. It is not uncommon for the landlord to borrow such money to make permanent improvements suggested by the tenants, who agree to pay a rise of rent equivalent to one or two per cent. below the rate at which the money is borrowed, the landlord making up the difference so long as he has to pay interest at all, at the end of which period the interest paid by the tenant becomes the landlord's profit in the transaction. There are, however, cases where the benefit of these loans for improvements cannot be obtained in full, because of existing mortgages on the estates of limited owners; in such instances the excellent principle of Sir Robert Peel's Drainage Loans may and does, without detriment to the interests of the previous creditor, admit of their being made a prior charge upon the land, because under it no outlay is sanctioned by the Commissioners which does not promise a return greater than the annual cost of redeeming the loan within a given period. The rate of repayment is by annual instalments of 6½ per cent., which in twenty-two years redeems the principal. The money is lent at 3½ per cent., and the additional 3 per cent repays the principal in the time stated.

In seeking to accomplish the improvement of his estate by the aid of such loans from Government, the landlord is naturally guided by the character of his tenantry. if they are thrifty and enterprising, all is well; if not, the wisdom of undertaking such improvements is somewhat nebulous. Backed by enlightened tenants a liberal

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landlord may freely venture on incurring what would otherwise be a heavy responsibility, and which is not an inconsiderable one in any case. The greater half of the work rests really on the tenantry, for on their building on the foundation laid by the landlord depends the success or failure of the experiment. It may be said that the tenantry as a rule have been found equal to the emergency in such cases. We may observe that the landlord's risk is really less than the tenant's, for the land is his and the improvements thereon; but the tenant, on the contrary, has no legal ownership in the improvements by which he supplements those made by the landlord. Not only has he no *legal* claim on the unexhausted improvements which he leaves behind when he quits his farm, but he is constantly liable while he remains on it to have his rent raised in accord with the adventitious value which the farm has received from his own outlay, energy, and intelligence. Instances are not far to seek where tenants have been unjustly dealt with in this way, yet it must be admitted that under all fair deal-dealing and enlightened landlords—and there are many such—a tenant is safe against such capricious treatment. At the same time it must be borne in mind that the landlord always has the power to checkmate an unthrifty tenant who would impoverish the farm all he could: he can get rid of him by a six months' notice to quit. But a tenant has no means of any kind to protect himself against the greed of a grasping and extortionate landlord; his improvements, sometimes rapidly made, do not repay him each year as he makes them; in many cases the improvements he makes—as, for instance, draining, boning, liming, re-seeding and the like—do not repay him under four or five years; and yet he is liable to be removed at any time, in order that another may reap the fruits of his labors. But let us admit that under the custom of the country he receives back on quitting his farm the unexhausted portion of the capital he has expended in adding to the fertility of the land—and in no case does he more than barely receive this—where, then, is the profit to which he was also fairly entitled? In a precarious business like that of farming, in which any man is liable to heavy reverses which he cannot ever retrieve, as a merchant may, by a large and lucky speculation,—reverses, too, which come of influences over which he has no control whatever,—surely it is not enough that a man should receive back the nude capital he has expended; and yet, when a change of tenancy occurs he does not, in ninety-nine cases out of a hundred, receive even this in full.

It will be understood from what has been said that farming in England is a much more complicated thing than farming in America, and I need hardly reiterate that in addition to the uncertainties of a proverbially fickle climate, the English farmer has commonly to contend with other uncertainties which are still more harrassing. Land in England is surrounded with a halo of sanctity, which is the *raison d'etre* of endless, harrassing restrictions, which are unknown in America, and will remain unknown there for generations to come. Such restrictions and supposed safeguards, in fact, are incompatible with such a splendid abundance of land as America possesses, and they will not be largely introduced until she has an extensive landlord class and three hundred millions of inhabitants. But in England we have a limited area of soil, much of which is in the hands of those whom tradition has taught to regard the ownership of it in the light of a divine right; and, such being the case, it is hardly to be wondered at, as human nature goes, that the land-owners should have hedged it round with every conceivable disability which, in these later days, they are ill-inclined to relinquish. Tenant-farmers are still bound under tenancy agreements to farm their land according to accepted methods and in given rotations, many of which are senile and out of joint with the times in which we live; they are required to crop the land in a given sequence, and to sell off only such items as the landlord may permit. It does not matter whether or not the stipulated systems and the crops raised under them are most profitable for the farmer; he must abide by his agreement or a heavy forfeit is the sequel. These

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restrictions are dying hard, but they *must* die nevertheless. The competition of America is so keen, and is increasing so rapidly in volume, that our farmers *must* have freedom if they are to live through the race at all. The Right Hon. John Bright, in replying to a letter from a Carnarvonshire farmer, recently said: "The whole conditions of agriculture in this country are unfavorable for the farmer and for the public. Misfortunes may change them, as they may force the farmers to say something and to exert themselves. I have preached to farmers for nearly forty years with but little result. American competition may speak to them and to our landlords with more effect." Mr. Bright is still, as he always has been, ahead of his time in his far-seeing counsels. Reforms he advocated twenty years ago are now accomplished facts; those he advocates to-day will be facts by the end of the century! *Nil sine magno vita labore dedit mortalibus.*

The lot of the agricultural laborer in England is better now than it ever was before. All things considered it is probably at the present time an easier and more tolerable one than that of half the farmers in the kingdom, and it compares very favorably with what it was in times gone by. That such should be the case is highly satisfactory, for to have a hard time of it in addition to being "divorced from the land" were indeed a deplorable state of things. Formerly the laborers were so numerous, in comparison with the demand for them, that wages were necessarily very low, and a working man could with difficulty, even when he had constant employment, earn enough to maintain his bodily strength, and to support his wife and family. Work, indeed, there was not for every man, and those who had no employment were supported by the poor rates. Happily this state of things has passed away, never to return we hope. Three hundred years ago the condition of the villein or agricultural laborer was deplorable, and even in recent times it was one of great hardship in the southern counties of England. Since Elizabeth's days, however, wages have advanced sixfold, while the price of bread has only doubled. In 1770 farm laborers' wages were fourteen pence a day, when wheat was forty-six shillings a quarter. In 1846, immediately before the repeal of the Corn Laws, wages were twenty pence a day when wheat was fifty-three shillings a quarter. At the present time wages are two to three shillings a day, and wheat has not advanced in price, as compared with a hundred years ago. It is competent, therefore, for the laborer of to-day to feed and clothe himself and his family in a manner far superior to that of his forefathers. He is well-fed, well-clothed and well-housed, generally speaking, and while he has money to spare for various pastimes, some of which are not commendable, his children receive a good plain education which enables such of them as have superior ability and tact to rise into positions far above what their forefathers ever dreamt of. For the laborer, as for any one else in England, though not always to the same degree, there is scope for energy and skill, and the reward of personal merit is sure. Compared with the artisans in the towns his life affords a picture of superior attractiveness; he lives in greater comfort, breathes a purer atmosphere, is less exposed to temptation, and, as he has less anxiety, sleeps better, and is healthier both in mind and body. It is probable, too, that the economic changes which the future has in store will add still more to his comfort and prosperity.

Tenant farmers are six times as numerous as the land-owners in the British Islands, numbering 560,000 in Great Britain, and 600,000 in Ireland. The cultivated land of Great Britain is in farms of the average size of 56 acres; in Ireland the average is 26 acres. Seventy per cent. of the farmers occupy less than 50 acres each; twelve per cent. between 50 and 100 acres; and eighteen per cent. occupy farms of more than 100 acres. Five thousand occupy farms 500 to 1,000 acres, and six hundred have farms upwards of 1,000 acres. The Domesday Book of the United Kingdom, published a few years ago, divides land-owners into two classes, those who own less and those who

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own more than one acre. Excluding the former as mere householders, we find that one-fourth of the land is owned by 1,200 persons, at an average for each of 16,200 acres; the next fourth is owned by 6,200 persons, at an average of 3,150 acres; the next by 50,770 persons, at an average of 380 acres; whilst the remaining one is owned by 261,830 persons, at an average of 70 acres. Those who own less than one acre form seventy per cent. of the whole number of land-owners great and small, and united they own less than a two-hundredth part of the land. It appears, then, that not more than one person in thirty is the owner of land, however small in area, in the United Kingdom.

The total area of the United Kingdom is 77,828,948 acres; that of England alone 32,597,398 acres. The United States and territories comprise an area of 2,311,544,959 acres, exclusive of water; and this is upwards of thirty times as large as the area of the United Kingdom! The area under wheat in England, in 1880, was 2,745,773 acres, showing an increase over the previous year of 27,781 acres; the area under barley was 2,060,807 acres, showing a decrease under the previous year of 175,294 acres; the area under oats was 1,520,125 acres, showing an increase over the previous year of 94,999 acres; the area under rye, beans, and peas, was 667,034 acres, showing a decrease under the previous year of 65,169 acres; the area under turnips, potatoes, and green crops generally was 2,659,134 acres, showing a decrease under the previous year of 77,354 acres; under clover, sanfoin, and rotation grasses, there were 2,646,241 acres, showing a decrease under the previous year of 28,708 acres; under permanent pasture there were 11,461,856 acres, showing an increase over the previous year of 228,330 acres; under flax there were 8,788 acres, showing an increase over the previous year of 1,818 acres; under hops there were 66,703 acres, showing a decrease under the previous year of 968 acres; and under bare fallow there were 759,845 acres, showing an increase over the previous year of 88,689 acres. The increase under wheat may be accounted for in the favorable weather which occurred in the latter part of 1879 for getting in the seed, and the decrease in barley to the disastrous harvest of that year. The increase in the acreage of oats may be ascribed to the less precarious nature of the crop, while the decrease in green crops is attributable to the wet spring of last year, which hindered the preparation of the land, as also may a great part of the increase in the area of bare fallow; on the heaviest soils, in fact, it was impossible to get in a crop of any kind at that period, and no little of the bare fallow is attributable to many of the heavy land farms being thrown on the landlords' hands in the spring of last year. The marked increase in permanent pasture is in keeping with previous years, and goes to prove that the land of England is going rapidly out of cultivation.

The total number of cattle of all ages in England last year was 4,158,046, showing an increase of 29,106. In the United Kingdom there were 9,871,153, showing a decrease under the previous year of 90,383, more than half of which was in Ireland. Of sheep there were in England 16,828,646, showing a decrease under the previous year of no fewer than 1,616,876; the total decrease for the British Islands was 1,998,338; it is worthy of note that there was an increase of sheep in Scotland to the number of 133,990. The number of pigs in the United Kingdom last year was 2,863,488, showing a decrease under the previous year of 214,618.

The serious decrease in cattle and pigs may be ascribed to the still more serious one in sheep, and the latter is owing to the terrible extent to which liver-rot was prevalent in the ovine world. The loss suffered by British farmers from this disastrous parasitic disease, may be estimated at from *four to five millions sterling* in the year ending June 4, 1880, and it is to be feared that the loss will be very seriously augmented during the current agricultural year. Whole districts have been entirely depopulated of sheep, and in many others a large proportion have succumbed to the malady, while thousands upon thousands have been "killed to save their lives." These Islands have

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been visited on several previous occasions with sheep-rot, but never so disastrously as now. It is not too much to say that many farmers have been utterly ruined by it. Nor is the mischief over as yet, for the poor animals still continue to die in many places, and the cause of the infection is not yet removed. It is attributable to the sequence of wet seasons, and there is scarcely any unsound land in the Kingdom that has not produced the animalculæ which develops into flukes in the livers of sheep. Even if the land had been previously well drained, still the mischief was there. In the worst localities even cattle were affected in like manner, and not a few were known to die from the effect of it. On the sound soils which need no draining, the limestones, the chalks, and the sands, the sheep remained healthy so long as they were confined to them, but on many of these soils the malady has been introduced by sheep which had been pastured for a time on the unsound ones. The disease is not communicable from animal to animal as ordinary physical diseases are, it is true, but it is to be feared that unsound sheep will impregnate even sound land with the germs, by means of the excreta from the alimentary canals, so that it is dangerous to bring sound sheep in contact with unsound ones on any land whatever. Such, at all events, is the impression which experience has created in some quarters. We are now having the hardest winter of many years, quite an "old-fashioned sort of a winter," and it is earnestly to be hoped that it will be followed by a dry summer or two, and another hard winter or two, in order that the cause of liver-rot may be eradicated from the land. Ten years ago there were loud complaints of the mischief done by dry summers, but apart from the fact that a present evil generally seems the greatest, it is certain that agricultural interests in England suffered less at that time than now. In any case, a dry summer this year will be hailed as a God-send, and so will a hard winter to follow it.

It is not easy to tell with certainty in the early stages of the malady, whether or not a sheep has flukes in the liver. And the reason is this: in the beginning, whilst these horrible parasites are obtaining a lodgment and developing in the system of the animal, they set up in the liver an irritation which causes that organ to perform its functions with more energy for a time, and the animal to thrive the faster in consequence,—a result which is commonly mistaken for a general improvement in health and physical vigor. It is indeed true, as many flockmasters know, that sheep will fatten quicker when they have recently become infected with flukes in the liver, and we have heard of cases where farmers have deliberately placed their sheep for a time within the influence of the infection, on land that is known to communicate it, with the express intention that they shall become fluked, and in order that they may fatten the quicker. The bulk of sheep now being killed in England are found to have more or less flukes in the liver, and so long as they are not very numerous and have not been very long in the system, the mutton is none the worse for them. In a sheep that has been fattened and killed before the flukes have become very numerous or have got firm hold of the system, the parasites are found on cutting the liver in sections; while in a sheep that has died from the disease they are found in numbers, and often of large size, in the liver and in some of the alimentary canals. They are flat little monsters, oval in shape, and sometimes almost as large as a five-cent piece. The liver is found to be enlarged and discolored, and it is so rotten that it is easy to pass a finger through it and pull it into fragments. The physical emaciation of the animal, the abundance of water, and the paleness and flabbiness of the flesh that is left, testify at once to the terrible nature of the malady and to the suffering which the poor animal has undergone.

When the disease has obtained a firm hold and is progressing rapidly, which is soon the case on low-lying and heavy soils, and in damp, muggy weather, the sheep become melancholy and fall away in condition. When these external changes are observed, internal structural changes are going on; the functions are weakening, and the flukes

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are robbing the sheep of the properties that go to form flesh and fat, at the same time so weakening the system that it cannot assimilate food as it ought, thus dissipating the appetite. The blood is deprived of its coloring matter and becomes weak and watery, unable to sustain the offices of life, whilst the paleness of the cuticle and the membranes betray the extent of the mischief. The healthy vermilion tint of the skin is displaced by a pale. dull, unhealthy color, or what hardly deserves to be called a color; the skin becomes flabby and loose, and dappled with yellow or black spots, while a watery fluid appears to be secreted under it, particularly about the lower jaw and neck; the wool turns a darker and faded color, while a hackling cough at times, with quickened though feeble respiration, rapidly increasing debility and stupor, and a great falling off in weight—so that one may easily carry a sheep in one hand, were it not that the wool comes off so easily—quickly lead the way down to death. Such is the character of the disastrous scourge which is still alarmingly prevalent in the British Islands. Sheep have rotted on land where, so far as record or tradition informs us, they never rotted before; and it is only where dry food has been freely used that complete immunity has been found. even on land that is naturally sound and dry, in some parts of the country. In not a few cases farmers have sold their entire flocks of breeding ewes to the butcher, rather than run the risk of a greater loss later on.

Nor have the other branches into which the agriculture of England may be divided suffered much less than that of sheep-husbandry during the past three or four years. During the three years following 1875 the profitableness of cheese-making has been steadily declining, and in 1879 it wholly vanished. American dairymen no doubt remember this. Inferior cheese old at a lower price in the Summer of 1879 than it had been known to do within living memory, and there was probably a greater disparity of price between high and low grades than we shall see again in a lifetime. In the Autumn of the year mentioned, cheese went up in price at a bound, and certain speculators made handsome fortunes out of it, proving that the market had in reality been artificially depressed. With certain fluctuations of no great importance the price of cheese has remained comparatively high since the sudden bound of a year and a half ago. During the greater part of 1880 prices were high enough, and farmers would have been quite content but for the small yield of the season. It may be said that when a fair quality of English cheese is worth sevenpence halfpenny a lb., or 75s. a cwt., in the wholesale market, our farmers have nothing to complain of with regard to price; but when the season's yield, as the case was last year, is one-fourth to one-third below the average, the aspect of the question is entirely altered. Some farmers declare they made little if any more than half the quantity of cheese they have been in the habit of doing in good years. The smallness of the yield is attributable to the wetness of the season and the scarcity of sun; the cattle were seldom dry and warm, out on the pastures, and the grasses were poor and washy, their nutritive properties having been very insufficiently developed; as a sequel to these things the cows gave less milk, and the quality of it was inferior.

During the past three years the number of cows and heifers in calf and in milk, in the United Kingdom, has averaged about 3,700,000, so that we have an aggregate milk production of 1,628,000,000 gallons, assuming that each animal yields, on the average, 440 gallons per annum of the beneficent fluid. Of this quantity it is probable that about one-eighth part is used in the rearing and fattening of calves, leaving a balance of 1,424,500,000 gallons available for human consumption. It is estimated that each man, woman and child in the British Islands swallows, on an average, in the forms of milk and various cookeries, one-third of a pint per day, or 15 gallons a year; such being the case, there is a consumption under this head of some 525,000,000 gallons, leaving a balance of 900,000,000 gallons to be converted into cheese and butter. Of this net balance we are probably not far wrong in assuming that 350,000,000 gallons are turned into

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cheese, and 550,000,000 into butter, in which event our cheese production will be about 126,000 tons, and butter will be made to the extent of 89,000 tons. But last year the number of cows and heifers in calf and in milk had fallen 45,000 below the average of the three years together, and they gave, it is supposed, some twenty-five per cent. less milk *per capita;* it is probable, too, that the consumption of milk as milk was greater last year than it ever was before, though it is hardly likely that much less butter was made. It follows, then, that our production of cheese in 1880 was upwards of 30 per cent. less than an average, and we shall probably not be far wrong in assuming that the quantities of butter and cheese would be nearly equal, say 85,000 tons of each. So far as we are able to read the signs of the times, it may be assumed with tolerable confidence that, whatever may be the case with butter, our annual yield of cheese is not likely soon to rise above the quantity last named, and that in the not distant future it will sink to a position permanently below it.

Meantime the milk trade is rapidly expanding, and already has become an altogether extraordinary thing. Ten years ago cheese factories were established in England, mainly on the American pattern, and in the course of a few years multiplied to the number of thirty or so. But the increasing demand for milk has not only checked the further extension of the factory system, it has closed several of the existing factories, and in time will close others. It has also closed great numbers of private dairies, and in some counties entire neighborhoods have relinquished cheese-making altogether, and many others have relinquished it in part. There can be no doubt that cheese-making cannot compete with the milk trade, which affords an average of eightpence to ninepence a gallon for milk—a price which is about equivalent to ninety shillings a cwt. for cheese. That is, on the home system of cheese-making upwards of a gallon of milk goes to make a pound of cheese, and the cost of making it falls little short of a penny per pound. The farmers of England are beginning to see the force of this, and are carefully cultivating the milk-trade. The chief disadvantages in the milk-trade are the frequency of bad debts, and the production of a volume of milk in Winter almost equal to that in Summer. Milk is, of course, dearer in Winter than in Summer, but the Summer trade is the more profitable, because the cost of production is less. In some instances the cheese factories are lending themselves conveniently to the milk-trade; they can send off each day the exact quantity of milk that a customer may need, and then make up the rest into cheese, so that in the hot weather there need be no serious loss from a surplus of milk. One of the largest milk companies in London, the Aylesbury Dairy Company, has a cheese factory of its own in the country, and the surplus milk, when there is a surplus, is made into cheese. The same practice has been tried at central depots in town, but with indifferent success. The great bulk of the milk consumed in London and other large cities is produced in country villages, often scores of miles away.

The importation of American beef has made the production of animal food in this country far less profitable than it formerly was to the farmer, and the wretched seasons we have had since '76 have in many cases turned it into a dead loss. However much our farmers may have suffered from the growing keenness of foreign competition, they have suffered still more severely from unpropitious years, and from diseases among their flocks and herds. The years '79 and '80, in particular, have been characterized by long periods of dripping rain; crops innumerable have been utterly ruined, in not a few cases carried bodily away by the floods; animals grazing on the pastures have not thriven as they ought to do, for the summers have been too sunless and wet; the land has been sodden with rain, until the very grass roots rotted, and forage crops have been immature at the best, and as a rule badly harvested; and, lastly, the land has with difficulty been prepared for roots which, in their turn, have been very inferior. Added to these disasters there has been the depressed condition of trade in the country, and

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the diminished spreading of money by the wage-earning classes. All these things have told heavily against all classes of our farmers, with, perhaps, the single exception of those who produce milk for the trade, and they too have suffered, though to a less extent. Owing to the prevalence of rot among sheep, mutton has been forced into the market in a manner altogether unusual, and beef has suffered from the unnatural competition. It is probable, however, that this state of agricultural anarchy, so to speak, is coming to an end, and that the live stock interests will fall once more into natural channels.

Meanwhile the working classes live far better than they formerly did. A vastly greater quantity of animal food is consumed, in the forms of flesh, milk, cheese, and butter. The prosperity of agriculture after all depends almost entirely on the working classes, who, when trade is brisk, and wages are liberal and constant, make a point of having good food and plenty of it. This is, of course, as it should be, and were it not for the extravagance which prevails in prosperous times, the generous dietary would not so quickly disappear when adversity comes, and fluctuations in agriculture would be less rapid and severe. But the increased consumption of animal food by the working classes, during the past ten or fifteen years, has created a demand which could not have been met but for foreign supplies, and the price of it has permanently advanced. The general trade of the country is now showing satisfactory symptoms of steady revival, and as our flocks and herds have seriously diminished in number during the past two years, while the population of the country has rapidly increased, a larger demand than ever will be made on food from other countries. It is not too much to expect that the price of beef and mutton will become very high during the present year, so that our farmers may recover some of the money they have lost in recent years. At the present time we are suffering from an alarming spread of foot-and-mouth disease, which was introduced by some cargoes of French cattle a few months ago; the holding of fairs and markets is prohibited throughout England until the end of February, and no movement of stock is permitted except by permission of the authorities. The current value of stock is, consequently, not easy to ascertain, but the closing months of last year showed an advance of 15 to 20 per cent. on the values of a twelvemonth earlier.

In figures previously given it has been seen that the growth of wheat is rapidly diminishing in England. It cannot be profitably grown in this country, in the average of years, at less than 45 shillings per quarter; and in seasons like the last three, it must be no less than 50 shillings if our farmers are to pay their way and live. On the vast prairies of the Western States of America, farmers will as a rule prosper if wheat comes within ten cents of a dollar per bushel and remains there until they have sold their crops; but in England it must keep within ten cents of a dollar and a half, if farming is to be even to a limited extent profitable. The cost of the transit of American grain to England depends on the temper of the railway and shipping companies, and the price at which it can be delivered in Liverpool will in like manner depend in no small degree on the profits with which speculators will be content. The freight from the Western States to Liverpool, including warehouse and other charges, cannot as a rule be less than one and a half to two dollars a quarter, and this stands in the place of the rent which the English farmer has to pay for his land. It is computed that the average yield of wheat in England is twenty-eight bushels per acre, in which event the English farmer has a margin of 56 shillings an acre; his rent as a rule may be something less than this, and were it not for certain other considerations he would be able to compete successfully with his American rival. It must, however, be borne in mind that the cost per acre in labor and taxation is much heavier in England than in America, and while the American farmer takes wheat year by year off his land, without the application of manure in most cases, the English farmer grows for three

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years other crops which to a great extent are subsidiary and preparatory to the one crop of wheat which follows them The other crops, it is true, may and do pay their way in ordinary years, yet at the same time they are regarded as preparatory to the one crop of wheat which is taken in a four-years' rotation. It follows then that the English farmer no longer may be regarded as having 56 shillings as a margin for rent, for the incidentals mentioned swallow up the half and sometimes the whole of it. This accounts for the yearly diminishing area of wheat in this country. And, again: In the one or two instances in England where continuous wheat-growing has been followed, whether for scientific experiment by Mr. Lawes, or as a practical operation on a large scale by Mr. Prout, it is found that manure at the rate of $10 an acre is necessary to maintain the normal fertility of the soil, in addition to thorough and costly cultivation such as the Western farmer dreams not of.

The Eastern counties of England—Lincoln, Nottingham, Rutland, Huntingdon, Warwick, Northampton, Cambridge, Norfolk, Suffolk, Bedford, Bucks, Oxford, Berks, Hants, Hertford, Essex, Middlesex, Surrey, Kent, and Sussex,—are the corn-growing districts; 64 per cent. of our wheat and barley is grown in them, and 74 per cent. of the pulse crops. The rainfall is ten inches per annum less in them than in the Western counties, which are mainly devoted to grass, oats, green-crops, the raising of stock, and dairy farming. These Western counties are Northumberland, Cumberland, Durham, Westmoreland, York, Lancaster, Chester, Derby, Stafford, Leicester. Salop, Worcester, Hereford, Monmouth, Gloucester, Wilts, Dorset, Somerset, Devon, and Cornwall. This division is not intended to bear an arbitrary interpretation as to the suitability of the one side of it for grass, and of the other for grain, for as there is no county in which no wheat is grown, so there is none in which no permanent pasture is found. The Western counties are, however, peculiarly adapted for grass and green crops, on account of the greater moisture and the genial warmth which are contributed to them by the Gulf Stream. It is for this reason, too, that Ireland is pre-eminently a grazing country.

The Government of England, so far at all events as agriculture is concerned, is in no sense a paternal government. We have no Minister or State Department of Agriculture. The Government exercises, as such, no control over agriculture—all that is vested in the Privy Council. It supports no School of Agriculture, nor does it maintain any flocks or herds for the improvement of the stock of the country—all these things are left to private enterprise. It does not support or encourage any great horse-breeding establishments, such as are found in many Continental countries under the direct control and assistance of the State. The Royal Agricultural Society, the Bath and West of England, and the Highland Societies, as well as all our other many and various bodies which are devoted to the advancement of agriculture, have been from the first, and still are, entirely self-supporting, and they have received no State aid whatever. It is true that members of the different Governments and of the House of Lords have in many cases done much, in their private capacity, to foster agricultural progress; and wealthy men of nearly all classes, whether themselves engaged in agriculture or not, have frequently gone out of their way to lend a helping hand to an industry of whose position and achievements the nation is justly proud; and thousands of earnest, thoughtful, practical farmers have devoted a great deal of their private time and means to the benefit of a calling which is of the first public and national importance. The greater part of the work on the Agricultural Societies, the general management, etc., has been done voluntarily and without pay, by those who take a warm interest in means which are calculated to end in improvement.

The improvement of our different breeds of cattle, for which no country has greater reason than America to be grateful, has been entirely brought about by private energy within the space of a hundred years. Robert Bakewell of Dishley, who may be re-

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garded as the first and greatest of those who have devoted their time and brains to the improvement of live-stock, had the distinguished fortune to set in motion a great and benevolent principle which has been gathering force ever since. He it was who first demonstrated the almost marvellous change for the better, of which animal forms are susceptible under intelligent management. He was the leader of the movement, and his apostles were the brothers Colling, Booth, Bates, and hundreds of others who have joined, and are still joining, the long list of those whose object was and is the improvement of the various breeds of domesticated animals. The action of all our agricultural improvers has been voluntary and spontaneous, having no assistance from the State, and remaining free from its control. The general principle by which our political system is guided, in reference to all kinds of industrial enterprises, is that they shall have fair play and no favor, being subordinate only to the general laws of the land and to the influence of free competition. Agricultural enterprise, therefore, being free from the guiding-strings of State, has become healthy, vigorous, and natural, stimulated by the friendly competition which has risen up among all classes connected with the land, and encouraged by the success of those who have been its practical exponents.

Mr. J. B. Lawes of Rothamstead is the man to whom the agriculture of England is indebted more than to any other one. On his estate in Hertfordshire he has carried out at his own cost, during the past thirty-five years, an elaborate series of experiments in continuous as well as intermittent corn-growing. His operations have always been open to public inspection, and the results of them have been annually published. The different plots have been systematically treated from the beginning, some of them receiving one kind and quantity of manure, others another kind, and yet others left without manure at all, the object being to ascertain the practice which is most conducive alike to profit and economy. One of the most valuable facts ascertained in the course of these experiments is that the sole manurial value, strictly speaking, of farmyard manure depends on the small quantity of chemical salts and of organic nitrogen which it contains, the bulky portion of organic matter being useful only in the way of lightening up the land and making it work the more easily, and of adding to its capacity for absorbing and retaining moisture; another, that corn may be grown continuously for a long period on the same land by the use of artificial fertilizers alone, without any diminution of crop or injury to the staple of the soil, though neither straw nor grain are turned to the land on which they grow. Not so, however, with plants of the order leguminosæ, as peas, beans, and clovers; in the case of the two former it has been found that they are peculiarly subject to disease, when grown too frequently on the same land, and that no system of manuring hitherto discovered will prevent it. With regard to red clover it is found that when the land has become clover-sick, no kind of manure can be relied on to secure a crop, and that, unlike wheat or barley, it cannot be grown continuously on the same land. For a period of twenty-four years kindred experiments with permanent grass-land have been continued, the result proving that the natural product may be doubled, and even trebled, by the regular employment of special manures. It does not, however, pay to grow wheat continuously, except for a limited number of years, and it is not surprising that a period extending beyond a third of a century should have proved that the land needs a change, however carefully it may have been cultivated and manured. The most remunerative practice is that of a rotation in which the land is heavily dunged with farmyard manure for mangels, turnips, or some other green crop, to be followed by two or three white crops—wheat, barley, or oats—which are manured with nitrate of soda and mineral superphosphate. It is well also to interpose clover for a year or two now and again, keeping the land clear from weeds and in a good state of tilth. Potash is indispensable to clover, which is injured by too free a dressing of ammonia. By a liberal and regular manuring of grass-land the better and more vigorous grasses crowd out the weaker and less valuable

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ones, and the weeds entirely disappear; on unmanured grass-land, weeds form 50 per cent. of the produce.

A great and benevolent agricultural reformer, Mr. Mechie of Tiptree, whose life-work may be regarded as extremely valuable to British agriculture, has recently passed away from amongst us. It is impossible to define the influence which Mr. Mechi's name and writings have exerted, but it has been immense in volume and varied in character. He may be regarded as the popular, and Mr. Lawes the scientific, exponent of the claims of improved husbandry. He was one of the best abused men of the day, when first he began preaching to English farmers about deep-cultivators, sub-soiling, the removal of hedgerows, artificial manuring, and various other new-fangled ideas that clashed with old-world prejudices, yet it is probable that he outlived all the enmity of that early period. By the aid of his influence over friends and enemies too, he moulded modern agriculture to an extent which cannot be defined, for his work was spread through a generation, and it embraced an Empire! The good Mr. Mechi did to agriculture was not so much by force of example—however striking that may have been to the thousands who saw his farm—as by the universal and oft-repeated discussions which his sayings promoted. He set farmers to work asking themselves and each other questions; the questions led to experiments, the experiments gave results, and the results opened people's eyes. He did not so much help others, as he taught them to help themselves. He stimulated inquiry and exertion rather than set example; yet did he always practice what he preached. As a writer he was pleasant, clear, incisive. Straight as an arrow his words went to any point he was driving at, and he put his propositions in a way that caused them to be remembered. He said the same things in many different ways, but then he was saying it to an infinite variety of minds. His was the little leaven which leavened the whole lump. He was hale, hearty, and heart-whole, and the severest criticism roused no rancor in his breast. He replied to his critics, or he passed them by in silence, with the greatest good humor. No one who knew him personally could long be an enemy, for he was one of the most genial of men. He suffered severe reverses of fortune, and his last days were not unattended by sorrow, but his name is the world's property, and he will be spoken of with respect when the names of greater men are lost in dim oblivion. *Requiescat in pace.*

Meanwhile, agriculture in England is again progressing, though slowly, despite the reverses of the past four years. In the corn-growing districts the value of land has declined, and in some cases it will not be restored for a long time, if ever. The stiff, adhesive clays are not adapted for permanent pasture, and they are costly to cultivate; they will remain among the least desirable land in the Kingdom. It is probable that good grass-land has not declined much in value at present, nor will it do so until the country's greatness begins to wane. For purely grazing purposes much of it is worth upwards of £100 per acre, and I have known £150 an acre paid for some that had no value beyond the green surface; in yet other cases it has fetched the fancy price of £200 per acre. Such prices may not be so easily obtainable now as they were a few years ago, for our farmers have passed through a period of severe adversity, and they know not what the future may be. Yet it will happen that a few years' prosperity will restore confidence to the people, and agriculture will flourish once more. Should it not do so, should this depression become permanent, should our flocks and herds continue to diminish and our farmers to despair, should our craftsmen lose their cunning and our shipping lose its sway,—then will have begun a something which the great young country of America will profoundly regret, viz., the final decay of Old England. Yet before this happens American civilization will have subdued nature from the Atlantic to the Pacific, and from the frozen Arctic Circle to the burning Panama. And even then may the Old Country look for comfort from the New one, for England cannot sink to nothing, and be forgotten, while America is great.

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FISH CULTURE.

BY

SETH GREEN,

ROCHESTER, N. Y.

Fish can be raised with less trouble and cost than other articles of food. The lakes and rivers are full of animal and vegetable organizations upon which fish can live, now wasted, but which should be utilized by stocking these waters with suitable varieties. There is not only an abundance of food, but it is also true that fish need less food to produce a given amount of flesh than is required by birds or quadrupeds. The amount which makes a pound of poultry or beef will make many pounds of fish; this is owing to the fact that they are cold-blooded and usually inactive animals. When we see them in water they are in motion because they see us; at times they go long distances in search of breeding places, but they are, as a rule, quite torpid in their habits. Animal action consumes the system. For this reason, those who wish to fatten cattle or poultry keep them confined. Animal heat is also a great consumer of food, and a large share of all that is eaten by warm-blooded animals is needed to maintain this vital heat. As fish are cold-blooded they need but little food for this purpose, and most that they take goes to make bulk and weight. The fact that this class of animals will live a long time without eating is familiar to all. There is but little waste to their system in any way. We frequently see birds and fishes kept in the same rooms; while the first are restless and need constant care and feeding, and frequent cleansing of their cages, the latter are almost motionless unless disturbed, and as the water in which they are kept is usually clear and fresh, it has in it but little food. It may be true that a pound of fish does not contain as much nourishment as a pound of beef; but the difference is by no means as great as the difference in cost of production. For some purposes of health it is much more valuable than a like weight of other food. Less care and labor are needed to raise fish than to raise other animals, or even to raise vegetables. We must give close attention to our flocks and herds throughout the year, and we must toil through a long season in our fields to make vegetables grow. Lakes and rivers are said to be like fields prepared for food. Fish only need our help in one way. At breeding times their eggs are mostly destroyed by numerous enemies, and but few are hatched.

By artificial means, at a trifling cost, nearly all the eggs can be saved and vast numbers of young can be produced.

While on this analogy it may be suggested that rotation of crops may be as advantageously introduced in pisciculture as in agriculture. In a portion of France, where the land is low and can be overflowed at pleasure by a system of dyking, crops of grain and eels are alternated, the latter being the most profitable; but this is only the germ of the true principle. When one sort of root or grain or vegetable is repeated on the same land it is found that the soil is exhausted of its food, while its enemies are augmented in number.

Incidentally, the same thing occurs with fish when they are kept in one locality. They use up their food and increase the list of their foes. As soon as this happens

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they suffer and should be supplanted by a different species, living on different food and having a totally different class of enemies. Wherever this has been done the effect has been surprising, the new species increasing enormously for the first few years, then meeting the fate of their predecessors. It is a curious fact that the stomachs of fish are so often found to be entirely empty of food, and the migratory varieties seem hardly to feed at all while preparing to spawn. This would imply either that they digest very rapidly or can go a long time without nutriment, and probably both of these deductions are true. Heat and motion are the main consumers of food, for animal bodies are physically machines which must be supplied with fuel if motion is to be generated, and will wear out with friction unless the waste is restored. A man or a horse can only perform his quota of work if his body is thoroughly nourished, and on the other hand neither needs nor can digest his full amount of food unless he works. The terrestrial animals are warm-blooded and active, many of them in their natural state getting their food by the chase, whereas fish are cold-blooded, and although occasionally making long journeys are ordinarily quiet.

The following points upon Fish Culture seem to be established: First.—Fish culture extending to every desirable variety of fish is entirely practicable. Second.—It may under proper management be made profitable to the producer, as much so or more than the cultivation of land or of land animals, and on similar conditions. Third.—It may furnish to all classes an abundance of cheap and the most nutritious and healthful food. Fourth.—It is absolutely necessary, in order to the preservation of the fish in the country from total destruction. Fifth.—Every section of our country, and all its creeks, rivers, lakes and sea-coasts are available for this care being taken, that the right kinds of fish be selected for the waters into which they are placed, observing latitude, climate, temperature and quality of the water. Sixth.—It may be carried on by stocking waters with young fish brought from hatching establishments, or by obtaining eggs for hatching, and both eggs and young fish may be transported safely to almost any distance. Seventh.—The money capital required for these operations is small—skill, care, patience, perseverance and common sense, the same as in other business, being the chief requisites. Eighth.—Individual enterprise is alone sufficient for success, though State action is desirable; indeed, legislation is essential, if not to foster, at least to protect those engaged in the business of fish culture.

SETH GREEN.

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FERTILITY.

BY

E. LEWIS STURTEVANT, M. D.

WAUSHAKUM FARM, SOUTH FRAMINGHAM, MASS.

As applied to land, this term expresses the amount of available plant food therein contained, and is usually measured by the annual yield. As however the yield of a crop is dependent largely on the variety of seed used, and atmospheric, climatic and cultural conditions, it at once becomes evident that the fertility of a soil is with difficulty so measured as to admit of expression in definite terms.

The fertility of a soil may be either natural or acquired, according to the history of its occurrence. We may change a barren soil into one of exceptional productiveness through the artificial application of the elements of plant growth, conjoined with the proper physical conditions; on the other hand, under proper treatment, crops may be harvested year after year without diminution, from exceptional areas, without the application of dung. In general, however, as fertility is removed by a crop, it requires to be reapplied in order to insure a profitable harvest, and thus the question of manuring in its various aspects is an essential one to the farmer, and one which seems at the foundation of a succesful agriculture.

Natural Fertility, as we shall define it, is the most important attribute to a farm, as being the contribution of nature to the farm products. It consists in the addition to the soil from the atmosphere, from unaided natural resources, and from oxidations or disintegrations, of the materials which enter into the composition of plants, and their changes into the form in which they are available for plant growth. Where the natural fertility is in great abundance, the cost of seed and the expense in labor may be the only elements which arise to offset the profits, or, in other words, which require to be deducted from the gross proceeds of a crop in order to ascertain the net returns. Thus, if the natural fertility of one field be sufficient to give an annual return of twenty bushels of wheat per acre (that is, if the amount of plant food in an available form supplied each year by nature is equivalent to a twenty bushel crop), and the natural fertility of another field is equivalent to but ten bushels, the first field has a value of ten bushels of wheat to the farmer for all time in excess of the second field, and even although through the application of dung or commercial manures the second field may be brought to a larger yield, yet under similar judicious treatment the first field must always return the larger profit. This definition and consideration of "natural fertility" must ever be an important one to the farmer, as it teaches that it may be often wiser to purchase an exhausted farm abounding in natural fertility than another farm yielding maximum crops, but whose crops have been produced through the excessive applications of manures upon land of inferior natural fertility. The former farm may, through the application of skill, be always expected to return ample profit to the cultivator, and will respond with certainty to the efforts of the cultivator, while the latter farm is continued in productiveness only through a constant expenditure.

The natural fertility of a soil may frequently be measured by a fallow; hence, in practice, that farm which will yield the largest crop from an exhausted field after a

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fallow, is, other things being equal, the more desirable one. The best illustration we have of the determination of the natural fertility of a field is offered in the experiments of Messrs. Lawes and Gilbert, in their Broadbalk field, as below:

Wheat.	12 *Years*, 1852–63.	12 *Years*, 1864–75.	24 *Years*, 1852–75.
	Bushels.	*Bushels.*	*Bushels.*
Plot 3. Unmanured continuously	15½	12¾	14
Plot 20. " "	15½	12	
Plot 2. Farm-yard manure	35¾	35	35¼

We thus have about 12 bushels for the natural fertility of the field, the produce of the last twelve years, and 23 bushels as the production from the 14 tons of applied dung. To anticipate our paragraph on *acquired fertility*, Plot 20 yielded in 1845, the first year of record, 24 bushels 2¾ pecks, or rather more than double its natural fertility; the surplus to be accounted for from the effects of plant food left over from previous manurings. Again, Plot 3 yielded but 5 bushels 3¼ pecks in 1853, and 21 bushels ¼ peck in 1854; a difference produced through seasonal and miscellaneous circumstances, so that in a review by single seasons we note the commingled effects of natural and acquired fertility. Let this illustration suffice *to impress upon the farmer the importance of averages as a guide, over the results of selected years or single trials.*

Under natural fertility may also be included that supply of plant food furnished to the land through the periodic overflow of streams, of which the most noted instance is found in the Valley of the Nile, but of which instances are also found in many of the river bottoms of America, and which in cases may be brought about through the artificial methods of irrigation, where the water holds organic and mineral matter in solution or suspension. In these cases, the natural supply may be sufficient for the annual cropping, and hence an artificial supply or dunging may be unnecessary, and the expense of plant food to the farmer be reduced to nothing. Such favorably situated farms, other things being equal, afford the most favorable conditions for agriculture.

Acquired fertility is the expression which covers the amount of plant food left over from preceding years. When a dressing of dung is applied to a field, all is not removed by the crop, and a portion of the balance is available for the next year's cropping. Hence, under judicious farming, a constant tendency towards improvement in fertility. The cropping of a field after a bare fallow is an excellent illustration of the use to which natural agencies may be put in order that sufficient fertility may become accumulated. By straining a point we may also include the effect of tillage under this heading, for by pulverizing and mixing the soil we increase the oxidation of the organic matter through the exposure and opening to the air, and as well assist the disintegration of the stony matter of the soil, and thus secure a greater expression of the natural fertility, which becomes serviceable to the plant.

The fertility of our land, as indicated by the farm crop, is consequently resolved into two factors, and may find expression in the following formula:—Natural fertility and acquired fertility. The value of our farm land being largely dependent on the first factor, the profit in an old country, and the systems of farming pursued, are closely connected with the nature of the soil after the acquired fertility is removed. In the newer regions, as in the West, the acquired fertility, or the accumulation of plant food in the soil, assumes a greater prominence, and the public fall into the error that it is inexhaustible, and the farmer, untaught by science, ever cries "Give, Give"—until ultimately his soil becomes in the condition as met with in the older States, and manuring and fertilization assumes a leading position in their agriculture.

Maximum and minimum fertility are expressions which may only be used on a sliding scale. Minimum fertility is an expression of the point where the profits become

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absorbed by the expenditure in obtaining the crop, even where the farm practice is the most judicious. Below this point we have agricultural barrenness. In many of the plain lands of the Eastern States such a condition may be found. Maximum fertility, again, should never be measured by the maximum crop. It expresses, or should express, the crop which is measured by the plant food present in the soil in as great a quantity as can be retained without unnecessary waste. It may often be measured by that amount of crop which, labor being equal, can be raised most economically by an ample supply of fertilizers or manures, for, agriculturally considered, profit is an essential element in these definitions connected with farming.

Although we do not have our fields in a fixed state, with reference to the fertile elements therein contained, on account of the effect of percolation, and the chemical and physical and vital changes constantly occurring within the soil, yet whenever a soil is below its maximum fertility, we may be sure that it is continually improving so long as we artificially supply the same amount of the elements of plant food which are removed by the crop. Hence the importance of calculations whereby the farmer may estimate the changes produced in his field by the addition of manures and the abstraction of crops, especially in those localities where the land is poor and competition keen, as here are circumstances under which the best intelligence is most needed to secure profitable returns. Indeed, wherever the conditions of culture are such that manure may be profitably purchased, the study of the condition of our fields as concerns their fertility, becomes an aid towards obtaining the best returns, which can illy be dispensed with. This course becomes the more available because practically but three elements of fertility need concern us, viz.: nitrogen, phosphoric acid and potash. It is also well suited to the exigencies of the American climate, for with us, on account of the greater evaporation and our other climatic conditions, there is a less loss of fertile substances through drainage than in England. Thus, in England, through a sandy, gravelly loam of 36 inches depth (Jour. R. A. S. of Eng., Vol. V.), with 26.61 inches of rainfall, 42.5 per cent. percolated. On Waushakum Farm in Massachusetts, in 1876, with 43.88 inches of rainfall, but about 11 per cent. percolated through 25 inches of a gravelly loam (*Scientific Farmer* Feb. 1877). We have a great need for experiments, however, to be carried on in the different sections of our country under diverse conditions of climate and soil. In default of more complete observations, we offer partial analyses of the water which percolated through the Waushakum Farm soil, a gravelly loam of light character, and which was in an exhausted condition at commencement of trial.

Lysimeter Water.		*Total Nitrogen in 1,000,000 Pounds of Water.* Pounds.
May 12, 1876.	From unmanured soil	.42
Nov. 13, 1876.	From heavily fertilized soil	5.56

If, then, we assume that the first percolation of any extent through the soil after the application of the fertilizer represents the largest per centage of loss of nitrogen for the year, we may arrive at the conclusion that the loss of nitrogen cannot be, in this case, in excess of the amount in 1,084,881 lbs. of water percolated, of 7.57 lbs. per acre, or about 6 per cent. of the quantity applied. These results are not in accordance with foreign determinations, but are doubtless correct under the circumstances under which they were obtained, and bear out our opinion that the leaching of fertility from our lands has been largely overrated in the popular mind. So much for the nitrogen. As for the phosphoric acid and the potash, we may assume for all practical purposes that there is no waste. We may therefore conclude that the principal loss of fertility to

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our land is in the removal by crops. It then becomes of importance to know what quantity we apply in our fertilizers, as well as what quantities our crops remove.

These tables of fertility have a practical value, and are deserving of the careful study of the intelligent farmer.

PER TON OF 2,000 POUNDS.

Manures.	*Nitrogen. Pounds.*	*Phosphoric Acid. Pounds.*	*Potash. Pounds.*	*Authority.*
Barnyard manure from cows—no litter used; covered	7.6	3.2	7.2	Johnson.
Old yard manure	9.2	3.2	14.4	Johnson.
Stable manure from street railroad stables	10.6	8.2	10.2	Johnson.
Farm-yard manure—mean, of 8 samples	7.6	6.2	6.4	Anderson.
Nitrate of soda—95 per cent. purity	312	..	..	
Muriate of potash—80 per cent. purity	..	..	1009	
Sulphate of ammonia—25 per cent. ammonia	411	..	..	
Sulphate of Potash—60 per cent. purity	..	..	658	
Pure superphosphates—15 per cent. sol. phos. acid	..	300	..	
Ammoniated superphosphates—3 per cent. ammonia, 10 per cent. phos. acid	49	200	..	
Rectified Peruvian guano—10 per cent. ammonia, 10 per cent. phos. acid, 2 per cent. potassa	164	200	40	
Dried blood—12 per cent. ammonia	197	.	..	

REMOVED BY CROPS.

	Nitrogen. Pounds.	*Phosphoric Acid. Pounds.*	*Potash. Pounds.*	*Authority.*
100 bushels potatoes, with tops	21	11	34	Stockbridge
50 bushels corn and stover	64	31	77	
1 ton English hay and clover	36	12	31	
1 ton English hay	26	8	31	
25 bushels buckwheat and straw	37	15	50	
1,000 pounds tobacco plant	80	11	115	
1 ton cabbages	9	6	15	
25 bushels wheat and straw	41	20	24	
25 bushels oats and straw	28	12	20	
20 bushels rye and straw	25	16	24	
100 bushels beets and tops	11	6	25	
100 bushels turnips and tops	11	8	18	
20 bushels peas and beans, and straw	53	20	33	
100 bushels onions and tops	11	9	4	
100 pounds lint cotton and stalks	17	9	16	

Such tables afford a useful guide for practice, yet it must be remembered that somewhat depends not alone on the quantity, but also on the state of combination in which the materials are found. This is especially the case with the phosphoric acid, which must be of the soluble form.

We will illustrate the use of these tables by an example. A certain field has borne this year 50 bushels of shelled corn. Now, if we return to the nitrogen removed, either in the form of 600 lbs. of dried blood, or 280 lbs. of sulphate of ammonia, or 6 tons of stable manure, then our field is brought to the condition, so far as concerns its nitrogen supply, as before the crop was taken off. So with the other ingredients; and it should,

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theoretically at least, be capable of giving another crop of at least an equal amount, if the conditions were accurately replaced. In those soils where one of these constituents may be in large excess, it is the part of judicious farming to recognize the fact of their presence and understandingly omit the ingredient in the application of manures, if in this manner the expense can be reduced. The theory of fertility is the presence of certain elements necessary for the subsistence of the plant in the soil, and in the proper form and distribution to be available to the plant. The practical condition for the most successful farming is to secure this result indicated by theory, in the cheapest and most reliable way, either through the application of a single element of fertility, or of a complete fertilizer—either dung or its analogue. The practical wisdom of our best experimental farmers indicates that for general use and continued use the general fertilizer is to be recommended, while for special purposes, and for the subsidiary application to crops, the special fertilizer is oftentimes advisable. Were our title "fertilizers" rather than "fertility," we should treat of this subject, so important to the farmer, more fully.

According to the reliable experiments and observations of Messrs. Lawes and Gilbert, the potash and phosphoric acid of the manured soil are more abundant in the upper than the lower layers, and are almost wholly retained within the reach of the roots. The nitrogen, on the other hand, is subject to waste. The roots of our plants do not occupy every interstice of the soil, and as the plant food is diffused through the soil much of it must escape appropriation by the plant. Indeed a soil may be agriculturally barren, and yet indicate to analysis sufficient plant food for the supply of many crops. Fertility then depends on other circumstances than the presence of a certain quantity of plant food, and it is with these circumstances, rather than the fact of the plant food, that agricultural experimenters should now be the most concerned. This fact is clearly brought to view in the experiments of Messrs. Lawes and Gilbert. They found that while from 2 to 2¼ lbs. of ammonia in manure was required to produce 52 lbs. of barley-grain and 63 lbs. of straw in England, it required 5 lbs. of ammonia to yield 61 lbs. of wheat-grain and 105 lbs. of straw. They also found that taking the average of many years, that but about one-third of the nitrogen applied in the form of chemicals was recovered by the crop. Again, the average of all their plots showed that while 3 lbs. of ammonia in the form of chemicals was required for each bushel of barley with its straw, over 8 lbs. when furnished in dung was required to produce the same quantity of crop, or, expressed in percentages, 44.8 per cent. of the nitrogen applied in chemicals was recovered in the crop, and but 17 per cent. of that from the dung.

The success attending the use of commercial manures or fertilizers in the New England States would seem to indicate that the conditions for the use of chemicals are more favorable with us than for the English farmer, yet in the absence of decisive and scientific experiment we are unable to more than suggest the difference to arise from the greater rainfall and evaporation of our climate, combined with the severe frosts which in many States lock up our soil in stony hardness so many months of the year.

All experience and reason teach this: that the growing of plants depends on the presence of chemical elements which are found in all agricultural soils, and that these elements being present in an available form it requires but judicious management on the part of the farmer to secure them in his crops, where the climatic conditions do not forbid; that all cropping beyond the natural fertility of the soil must result in deterioration of fertility except where these elements of plant food are resupplied as removed by crops; that acquired fertility cannot produce crops indefinitely, and that all produce gained from this source is but the realization of capital invested.

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NOTE.—The following lysimeter results have a connection with our subject, and are worthy of going on record. The lysimeter, or percolation gauge on Waushakum Farm is one five-thousandth of an acre in area, and contains twenty-five inches of soil in its natural relations. This soil is a gravelly or sandy loam, and its surface occupied by a sod.

		Rainfall. Inches.	*Percolation. Inches.*	*Evaporation. Per Cent.*
January, February, March, April	1876	16.61	2.546	84.7
	1887	14.90	3.557	76.1
	1878	20.49	3.882	81.0
	1879	15.37	1.087	92.9
	Average	16.84	2.768	83.5
May, June, July, August	1876	12.63	0.611	95.1
	1877	13.00	0.685	94.7
	1878	15.00	0.547	96.3
	1879	14.48	0.515	96.5
	Average	13.77	0.589	95.7
September, October, November, December	1876	14.64	1.606	89.0
	1877	15.39	7.208	52.9
	1878	18.87	4.798	74.5
	1879	9.98	0.000	100.0
	Average	14.70	3.401	76.8
For the twelve months	1876	43.88	4.763	89.15
	1877	43.29	11.445	73.52
	1878	54.36	9.237	83.06
	1879	39.83	1.602	95.98
	Average	45.34	6.759	85.1

Foreign results, such as I find record of, are given as below for the sake of the comparison:

	Rainfall. Inches.	*Percolation. Per Cent.*	*Evaporation. Per Cent.*
ENGLAND.—Lysimeter 36 inches deep, grass on surface, soil sandy, gravelly; 8 years average. [Journal R. A. S., Vol. V.]	26.61	42.4	57.6
ENGLAND—ROTHAMSTEAD.—Heavy loam, clayey, surface bare; 5 years average	28.00	..	..
Lysimeter, 20 inches deep	..	36.8	63.2
40 "	..	36.0	64.0
60 "	..	28.6	71.4
SWITZERLAND—GENEVA.—Depth not given; character of soil not given. [Bibl. Univers. de Gen. Sc., t. 1.]	26.00	39.0	61.0
FRANCE—ORANGE.—No particulars. [Gasparin, Cours de Agric.]	28.00	20.0	80.0
AMERICA—WAUSHAKUM FARM, South Framingham, Mass.—As above given; 4 years average	45.34	14.9	85.1

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COUNTRY HOMES AND WHO SHOULD HAVE THEM.

BY

REAR-ADMIRAL DANIEL AMMEN,

U. S. NAVY, WASHINGTON, D. C.

A residence in the country for the past eleven years enables me to form a definite idea of its advantages and disadvantages in the abstract, and perhaps to indicate who can and who cannot advantageously go into the country. For persons of large wealth I have no advice to offer; they can try it by paying a money consideration, and may not be the poorer for the experience; wealth at least permits a choice of life.

Persons of moderate means, whose vocations permit a residence in the country, may live there with advantage provided they locate along a line of railroad, and not too far from a station. I would say, if the journey to the city is a daily affair, any distance beyond half a mile from the station will be found after a time irksome; for the laboring man, half that distance would be better, and he should locate no further from the city than sufficient to secure fresh air and enough land to make a good vegetable garden, and provide his family with an abundant supply of small fruit, and such fruit trees as the ground will admit; one acre being all that a laboring man could make use of with advantage for simply raising his home supply.

Some of my country friends who are located on large tracts of land at distances from cities, ranging from two to six miles, find themselves practically further away in point of time and cost, than if they were a dozen or more miles distant, near a station on a railroad. They have to keep their conveyances, which have to go and come often at inconvenient hours, and subject to all the vicissitudes of the weather and to the unavoidable changes of intention or necessity which no human foresight can anticipate. Yet the distance so inconvenient to them is within the easy stroll of city thieves who rob hen roosts and fruit trees to such a degree as quite to preclude the raising of home supplies with a reasonable prospect of their being spared for home use.

Whilst a laboring man should as a matter of choice locate quite near a city, persons who may desire some acres of ground should for various reasons prefer a distance of ten or more miles. It is worth while to remember that land half tilled or cared for is unproductive and unsightly, and holding it is bad economy. Buying sufficient land conveniently situated for a residence is far more economical than a great deal of land not so convenient, and this depends upon how frequently your business or your pleasure calls you or your family into the city. Land situated so as to require considerable exertion in travel daily, say two miles from a station, would be dear for the owner even though it were presented in mistaken kindness. The greater number of persons who go into the country wish to buy cheap land, and disregard too much the fact that, if not favorably situated, every day imposes its tax in lost motion, and in providing means to come and go, which at the end of the year amounts to the interest on a considerable sum. Then too, persons who come from the city may miss a train, or choose to go in a later one, and if a conveyance from a station to a residence is a necessity for comfort, then it is a question of the conveyance waiting, whatever the

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weather may be. This, sooner or later, will "disgust" people with the country, when in fact it has relation only to an inconvenient location.

In cities many persons find themselves weary with the endless routine, and frequently suppose that to be an indication of fitness for a country life; a love of nature too, may incite, but if not accompanied by an active disposition such as impels to plant trees or flower beds with one's own hands, however much money is spent, if a country home is sought, the surroundings will not "blossom as a rose." If one is content with the luxuries of life, and to look upon physical exertion as so much lost motion, or, if with the gentle sex, a close study of the fashions and comparison of finery is a prime necessity, a country home cannot be more nor less than a barren waste to them; let not for a moment the fatigue or satiety of city life delude them into the belief that "they would love the country."

But in the cities there are active men and women who feel how much time is absolutely wasted in the merest ceremonies; how much childhood is deprived of, and how little the parents can secure either a healthy, physical development, or a required personal control to train children in the way they should go. To such persons the country, with whatever discomforts are unavoidable, is yet a land of promise. If they possess industry and good taste they will be able to make the change with advantage, and will enjoy mounting rough horses, and with their children pursue the woodland paths far and near; they will plant their trees and shrubbery, or, if their means be more limited, be content in leisure hours to wend their way on foot along by-paths of hill and dale, beneath the forest trees, and to employ a certain part of their time in the cultivation of small fruits, their flower beds, and their more useful vegetable garden.

Of course the agreeability of a country life depends very much on securing a good and convenient location, and to attain this it is necessary not to be in too much haste; a fine brook or free flowing springs will add greatly to the possibilities of improving the grounds, and trees, sufficient at least to give a comfortable shade, should be regarded as a necessity, as it takes too much time for them to grow after planting, to meet a reasonable requirement for the present. With these conditions, and convenience of getting in and out of the city, a country home may be made most desirable, but it is worth while to remember that persons who have lived in cities will not be content, usually, unless they can see something of movement and life in their surroundings, and can go and come at will.

The cost of living in the country is in a considerable degree dependent on personal ideas and tastes; at first, at least, it will probably be quite as much as living in the city, in the purchase of stock and implements, and in acquiring practically the knowledge necessary to carry out the improvements which may be desired; but at all events, unlike city life, in making expenditures you have at least "something to show for your money."

Almost every part of our country has the means of improving and embellishing a country place at comparatively small cost; here, in Maryland, the forests abound in many beautiful deciduous trees and evergreens, among the latter thousands of beautiful hollies; only a little industry and knowledge is necessary to transplant them at will; the country abounds in superb brooks which flow freely the year round; only a little industry or money is necessary to plow the ground and scoop it out, and thus, at small cost, secure fine ice ponds, which serve as well for bathing, and may be stocked, without cost, with superb carp which thrive surprisingly in these waters. Doubtless, conditions more or less favorable exist in the vicinity of all our cities on the eastern slope of the Alleghenies, and over the whole United States with few exceptions.

The danger to health in city life, especially to children, is well known, but is generally supposed to be confined to the hot season; yet a friend of mine, an excellent

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physician, and exceedingly careful as to the means necessary to preserve health, found two of his children attacked by diphtheria, and also a case of scarlet fever occurring a second time after a lapse of three months; on examination, to his surprise and horror, he found the source of these scourges in the stoppage of a sewer beyond his premises, and the backing up of its contents. In contrast with this, the diphtheria is scarcely known in the country in this region, and although the scarlet fever has within the past ten years visited this neighborhood no less than three times, and not less than fifty cases, only one death has occurred, and that was the child of a physician. This exemption is doubtless due to the greatly increased vitality of children who have pure water and milk, and habitual exercise in the open air nearly the whole day when the weather will permit.

Years ago I was painfully struck with how entirely the routine duties of life occupied the time of one of my friends, who was, withal, very charitable. She was absolutely unable to read anything except her prayers from lack of time, and it was always a wonder to me how she was able to converse on the literature of the day without reading, until I remembered the fashionable literary chit-chat that came to her daily from many mouths; but what a source from whence to derive information of any kind!

In city life there is what is known as "style" dependent upon the aggregate forming the society, which is quite inexorable; thus many persons consider themselves forced to spend more money than they should, and who waste their time in a great measure in vanities. However keenly such persons may feel their situation and deplore it, they should not delude themselves into the belief that a country life would suit them, or that if there they would not suffer in some other form the misery which they suppose society imposes upon them.

But supposing an adaptation to a country life, there are certain advantages that cannot fail to be apparent: A freedom in proper and unrestrained action which the demands and surroundings of city life will not permit; a far greater personal control in the formation of the physique and the morale of children than can be attained in the city under any condition of wealth, competency, or actual poverty; abundance of pure air and a wide range of horizon; and when in the heat of summer the sun goes down, the cooling of the atmosphere and a good night's rest, when in the cities the radiation from the heated bricks and streets keeps up the temperature to such a degree as to make a refreshing sleep impossible; and the ability of enjoying nature, meditations and reflections, so far as a Creator has endowed us.

North of Wilmington, Del., professional men, men of wealth, mechanics, merchants, and laborers seek in great numbers homes in the country. Until the population at any given point is sufficiently established to support good schools they bring their children to and fro with them for instruction in the city; but this transition state is soon passed, and schools and churches are built to supply local wants. Further South country homes are not much sought, although the country possesses situations desirable in all respects, and the lands are purchasable at almost a nominal price. Among the ancient Romans country life was sought by men of eminence, and its advantages were portrayed in glowing colors. The modern Briton of position regards with pride above all his other possessions his country home, and is quite disposed to sneer at "town people" whatever their cultivation and wealth may be. A love of the country and an appreciation of its advantages is only partial with us and seems to be more general in New England than in other parts of the United States.

Above all, the persons least fitted for a country life with us, of whatever condition, are those who consider that the spending of a given amount of money insures a given amount of enjoyment, that money and enjoyment can be put in the scales figuratively, and relatively balance in just proportions; there are many such persons,

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especially among those who have become suddenly rich—of course a state of extreme poverty, when honestly relieved, approximates to enjoyment being an equivalent of money, as the man relieved from illness and pain regards his condition as happy indeed.

Thousands of years ago it was written: "Remove far from me vanity and lies; give me neither poverty nor riches; feed me with food convenient for me." The lapse of ages, and all the generations of men who since then have lived and died, have not impaired the wisdom of those words, as true to-day in their application to humanity as upon the day they were uttered, however much false ideas and dazzling illusions, the mirages of life over its heated field, abuse and deceive the mental vision! Those who most understandingly and sincerely appreciate these great truths are adapted to a country home, so far at least as sentiment is concerned.

DANIEL AMMEN.

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THE AYRSHIRE BREED OF CATTLE.

BY

J. D. W. FRENCH,

EDITOR OF "THE AYRSHIRE RECORD;" SECRETARY AYRSHIRE BREEDERS' ASSOCIATION,

NORTH ANDOVER, MASS.

The County of Ayr, Scotland, is divided into three separate districts—Carrick, Kyle and Cunningham. In the last named the greatest improvements in the Ayrshire breed are said to have taken place.

Previous to 1780 the cattle in Ayrshire are generally admitted to have been an unshapely and inferior breed. Since that date a great improvement has been apparent, so that at the present time, for vigor of constitution and general adaptation for the dairy, they stand at the head of all British breeds.

The climate of Ayrshire is generally humid, and the surface of the country is diversified with knolls, hills and dense woodlands. In 1867 only 315,000 acres, less than one-half of the area of the county was cultivated, and about one-third of the remainder was reckoned as good grazing ground, and even that often gave scanty feed to the cattle. As to the origin of the Ayrshire breed, we are somewhat in the dark; but from the best authorities we gather that the first decided improvements began to appear soon after the introduction of some foreign breed. Whether the Teeswater the Dutch, or the Alderney, had the chief part in this improvement, is still a matter of uncertainty.

The Ayrshire breed is pre-eminently adapted to many parts of our own country, for the reason that it has been bred in a country very similar to many sections of our own in climate, soil, and its natural features; for all these have a marked influence on the organization and structure of an animal.

"It is highly necessary to take into consideration the class of animals that will suit the farm, it being much better to get them of a size rather under than over the capabilities of the soil, as in that case improvement will begin at once, whereas if the opposite has been the case the stock will recede."

There need be no fear that a cow raised on the hills will recede when moved to the lowlands. With improved feed would come better results; but the opposite policy might be disastrous.

BEEF QUALITIES.

Although not a beef breed, the Ayrshires will make as good if not better beef than any other dairy breed, and will put on flesh more easily. Youatt says that "they unite, perhaps, to a greater degree than any other, the supposed incompatible properties of yielding a great deal of milk and beef;" that "they will feed kindly and profitably, and that their meat will be good;" that "they will fatten on farms and in districts where others could not be made to thrive at all, unless partly or principally supported by artificial food." Gilbert Murray, in "The Cattle of Great Britain," published in 1875, writes: "The most desirable quality of dairy cows of any breed is that they should yield a large quantity of milk in proportion to the food consumed; and that when dry they should feed quickly. The pure bred Ayrshire certainly excels all

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others in the former, and, as to the latter, she is in no way inferior to many of the best-established breed inhabiting these islands." Some of the actual weights of Ayrshires butchered in this country are given below:

"Ada" (cow), dressed meat, 882 lbs.; tallow, 111 lbs.; hide, 70 lbs.
"Str. Lass" (cow), dressed meat, 608 lbs.; tallow, 68 lbs.
"Betty Burke" (cow), dressed meat, 550 lbs.; tallow, 42 lbs.; hide, 63 lbs.
"J. Burke," 3d (heifer), " " 420 " " 40 " " 50 "
"Julia Douglas," " " " 460 " " 35 " " 62 "
"Fitz James" (bull), " " " 980 " " 84 " " 125 "
"Andover" " " " 860 " " 61 " " 130 "
"Edmund Burke" (bull), dressed weight, 1,100 lbs.
"Birnie" (bull), live weight, 1,800 lbs.

DAIRY QUALITIES.

The real merits of a dairy breed are not to be judged by the exceptional cases of extraordinary yields, which are generally so well advertised, but by the average yields of different herds. The true criterion is not what one cow will do, but what will all the cows of a herd do. This is the test which will show whether a breed or herd is profitable or unprofitable to keep. Again, the true test of an individual is her yield for a year, not for three or six months only. Another important factor in estimating the value of a dairy cow is the amount and value of food consumed in proportion to yield of milk. Twelve Ayrshires of Mr. A. Libby of Maine averaged in one year 7,582 lbs. Their feed was 2 quarts shorts, 1 quart Indian meal, ½ bushel roots, and hay, in Winter; in Summer, pasturage, with fodder corn in season. The Oneida Community's herd of 37 cows averaged for one year 5,498 lbs., or 2,557 quarts.

The average yield of the herd of C. M. Winslow, Brandon, Vermont, 13 head (cows and heifers), was last year (1880) 5,679 lbs., or 2,641 quarts.

The yield of the Waushakum Farm Ayrshires for a series of ten years is as below: 1871, 2,334 quarts; 1872, 2,812 quarts; 1873, 2,528 quarts; 1874, 2,633 quarts; 1875, 1,901 quarts; 1876, 2,326 quarts; 1877, 2,466 quarts; 1878, 2,160 quarts; 1879, 1,903 quarts; 1880, 2,362 quarts. Average for 10 years, 2,342½ quarts.

The yield of the "Cherry Brook" Ayrshires, Weston, Mass., for 6 years is as follows: 1875, 2,941 quarts; 1876, 2,661 quarts; 1877, 2,422 quarts; 1878, 2,678 quarts; 1879, 2,633 quarts; 1880, 2,691 quarts. Average for 6 years, 2,671 quarts.

The New Jersey Agricultural College reports the following yield for 3 years: 1871, 7 cows, 3,130 quarts; 1872, 6 cows, 3,258 quarts; 1873, 5 cows, 2,651 quarts.

The following yields are credited to the herd of A. M. Cornell for the year 1875. Phœmie, 8,538 lbs.; Pawkie, 7,961 lbs.; Moss Rose, 7,683 lbs.; Lucky Lass, 5,549 lbs.

The Maplewood herd, Fitchburg, Mass., for 5 years averaged 2,642 quarts per cow.

Cochichewick Farm, North Andover, Mass., yield for 7 years: 1874, 8 cows averaged 6,934 lbs. of milk; 1875, 11 cows averaged 6,218 lbs. of milk; 1876, 11 cows averaged 5,310 lbs. of milk; 1877, 12 cows averaged 5,343 lbs. of milk; 1878, 10 cows averaged 5,316 lbs. of milk; 1879, 13 cows averaged 5,222 lbs. of milk; 1880, 13 cows averaged 5,720 lbs. of milk. Average for 7 years, per head, 5,723.28 lbs., or 2,662 quarts.

The record closes each year January 1st, so that the actual number of days a cow is in milk is not given, but only the number of days in milk during the current year.

The feed has been very moderate, the chief object being to keep the animals in good breeding condition rather than to force them to make a large milk record. In Summer the feed has been pasturage, sometimes, in addition, fodder corn or grass, and a part of the last season, on account of drought, two quarts of shorts. In Winter the daily ration is hay, eight to ten quarts roots (mangolds), and two quarts grain. The milk is weighed daily.

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The Royal Agricultural Society's Journal of 1868 gives the record of an Ayrshire cow producing, besides supplying the family with milk and cream, 269, 282½ and 274½ lbs. of butter for three successive years. Another cow under the same circumstances yielded 399½ lbs. in ten months. Cows have been known in this country to produce 10 lbs. per week.

A communication to the *Country Gentleman* from Crary's Mills, New York, gives the yield in butter of 23 Ayrshire cows for one year, which amounted to 6,323 lbs., or 274.91 lbs. per cow. During the Winter the cows were fed on hay, corn-stalks and green oats (probably cut hay is meant), and a small feed of bran and corn meal mixed, and after calving about one peck of beets to each. In Scotland nine to twelve quarts of milk is estimated to one pound of butter, and in cheese 500 to 600 lbs. is an average yield for a cow.

The Ayrshire is pre-eminently the farmer's cow; she quickly responds to good treatment, and under less favorable circumstances does surprisingly well.

There is no dairy breed that, with an equal amount of roughing under bad treatment or poor food, can surpass her yield or condition.

Although many additional facts might be stated in advocating the claims of the Ayrshire cow to the attention of farmers and dairymen, the space already occupied warns me to forbear.

In conclusion I take pleasure in quoting from an essay published in 1880, on "The Milk Pail and the Cows that Fill It," by Prof. J. P. Sheldon, author of "Dairy Farming," who says of the Ayrshires: "They are wonderful milkers, doing well in milk where most other breeds would hardly live—more completely than most, if not all other breeds, they possess the property of converting into milk the elements of food. They are hardy enough to stand severe climates, while they have the faculty of quickly adapting themselves to altered conditions. A careful examination of the milk of different families of Ayrshires would seem to indicate that the breed might be divided into two classes—the one for butter and the other for cheese. The milk of one of these types has butter globules scarcely inferior to those of Jersey milk, though they vary much more in size, while the globules in the milk of the other are much smaller and more numerous; the former represents the butter and the latter the cheese type of Ayrshire cows."

He then proceeds to classify them in the order of merit for the dairy under different heads:—

For Milk	the Ayrshire	is placed	first.
" Cheese	"	"	"
" Butter	"	"	fifth.
" Milk and Beef		"	fourth.

In classing for butter only, he disregards the mere quantity of milk, and considers the yield of butter in connection with size of cow, which may partially account for the Ayrshires not taking a higher and perhaps deserved rank.

The Ayrshire breed, however, has the highest average excellence for all classes. No other breed stands at the head in two classes.

POINTS.

The Committee appointed by the General Meeting of the Ayrshire Agricultural Association (Scotland), May, 1853, "to fix the points in Ayrshire cattle which shall be held of most importance as indicating superior quality," after careful inquiry and consideration report the following points which should, in their opinion, be attended to:

Head—Short; forehead wide; nose fine between muzzle and eyes; muzzle moder-

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ately large; eyes full and lively; horns wide set on, inclining upwards, curving slightly inward.

Neck—Long and straight from head to the top of the shoulder; free from loose skin on the under side, fine at its junction with the head, and the muscles symmetrically enlarging towards the shoulders.

Shoulders—Thin at the top; brisket light; the whole forequarters thin in front and gradually increasing in depth and width backwards.

Back—Short and straight; spine well defined, especially at shoulders; the short ribs arched, the body deep at flanks and the milk veins well developed.

Pelvis—Long, broad and straight; hook bones (ilium) wide apart and not much overlaid with fat; thighs deep and broad; tail long and slender, and set on level with the back.

Milk Vessels—Capacious and extending well forward; hinder part broad and firmly attached to the body; the sole or under surface nearly level; the teats from 2 to 2½ inches in length, equal in thickness, and hanging perpendicularly—their distance apart at the sides should be equal to about one-third length of the vessel, and across to about one-half of the breadth.

Legs—Short; the bones fine and the joints firm.

Skin—Soft and elastic, covered with soft, close woolly hair.

Colors preferred are brown or brown and white, the colors being distinctly defined.

J. D. W. FRENCH.

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JERSEY CATTLE.

BY

RICHARD GOODMAN, JUN.

YOKUN FARM, LENOX, MASS.

This breed of cattle surpasses all others in both quality and quantity of butter product. They are also distinguished for vigor of constitution, gentleness of disposition and beauty of form and color.

No breed of animals is receiving more attention in England and America to-day, from practical and theoretical breeders, than this race of cattle, and none, it may safely be said, have ever proved more responsive, more interesting or more profitable. The Jersey has as long a history, and as creditable, as any of the well established breeds, and a history which, while it shows that they possessed positive qualities at the first, they possessed also the capability of great development in respect to these good qualities, and that in the face of what were at times very unfavorable circumstances.

Over one hundred and fifty years ago visitors to the Island of Jersey found there a race of cattle as distinctive as any in their general characteristics, and surpassing all in the quality of their butter. Among other proofs that this race had at an early date a peculiar character of its own, and a peculiar value in the eyes of its owners, is the fact that a law was passed by the States of Jersey, as long ago as 1789, prohibiting under the most severe penalties the importation of cattle from France; and earlier yet, in 1734, Rev. Mr. Falle wrote an elaborate and enthusiastic argument in proof, as he expressed it, of "the peculiar goodness of our butter."

Regarding the origin of this breed little can with certainty be said. There is little doubt, however, that the progenitors of the race now known as Jerseys came from the mainland, the nearest points of the coasts of France being within easy reach, and a close resemblance between the cattle of Jersey and Brittany being observable to-day.

Admitting the common origin of the cattle of these two countries, the wide divergence at present existing between them can easily be explained. Three leading causes can be pointed out, any one of which would be sufficient for our purpose. In the first place the Jersey cow is the result of the remarkable *climate* of the Channel Islands. The mild and uniform character of the climate of Jersey has hardly its equal in the world. It is as warm and genial as the south of France when the south of France is at its best, and it has the uniformity which the presence of the warmer waters of the Atlantic in that region of the earth probably accounts for. This mildness, this moistness, and this unchangeableness, give us all the conditions necessary for the constant production of a sweet, tender and nourishing herbage. In consequence we find the *pastures* of Jersey praised by all writers, and this pasturage is the second factor in the development of our butter cow. The third element is the character and conditions of the people who had these cattle in charge. By race and language French, by conquest and business relations English, the inhabitants of the Island of Jersey can be said, from an agricultural point of view, to possess many of the merits of both races. They are frugal where the English are lavish; they are enterprising where the French would be tied down by traditions; they hold fast to what is good with Gallic

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tenacity, yet they have shown an interest in the improvement of their crops and their cattle truly British.

What conditions could have been more favorable than those produced by such a climate, such food, and such careful and intelligent breeders? But to these there is an important item to add, namely: the markets in which the Jersey cow and the Jersey butter were sold; markets in which close competition was to keep up a high standard, but markets in which many wealthy purchasers would be ready to reward the highest skill. Such markets were found in London. Near at hand and regular in their demand the year through, the markets of London did much to encourage the Jersey farmer. The Jersey breeder and butter-maker enjoyed a climate equal to the best of France, but being a British subject he had access to English markets which was denied to all Frenchmen.

At the beginning of this century, Thomas Quayle, who had passed six months in a careful study of the industries of the Channel Islands, writes at great length of the large and steady demand in England for Jersey cattle; they not only brought fancy prices for gentlemen's places, but there was a regular sale at uniformly high prices for the general English market. What the number of the cattle sent from Jersey to England, annually, in the early part of this century was, we have no means of knowing, but in 1846 the number had risen to seven to eight hundred cows and heifers every twelvemonth. At the present time, though many Jerseys are bred in England and America, these two countries receive from the Island nearly three thousand animals a year.

During the first quarter of this century, though the purity of the breed was jealously guarded, nothing of importance was done in the way of "breeding" as we now understand the term. The better animal was bred from and the poorer killed; the better animal was kept at home because of the higher price put upon her, and the poorer and cheaper one sold. But this was done in a careless, unsystematic way. And the same may be said, to an extent, of the raising of the crops upon which the animals were to be fed. The result was that, though farming and breeding on the Island of Jersey kept far ahead of that upon the continent, it fell so far behind that of England that the prices of the Island cattle for export began to fall off.

At length, believing that the character of their cattle was deteriorating, and believing also that good results had followed the institution of agricultural societies in England, some of the leading citizens of Jersey decided upon establishing for themselves a society for the improvement of their crops and their cattle; "to preserve," as they expressed their intentions, "the original breed from all admixture, and to preserve a trade that had hitherto proved of so much advantage to the island." Cattle shows were forthwith established; judges were appointed, and a scale of points for the guidance of these judges was adopted; the prizes offered were coupled with valuable regulations in regard to the retention of the prize animals on the island. No person, for example, was allowed to receive a prize for a bull until at least one whole season after the prize was awarded; moreover, any person withholding the service of a prize bull from the public was to forfeit his premium; all heifers having had premiums adjudged them were to be kept on the island until they had dropped their first calf.

The work of this society was so wisely planned, and so patiently and industriously carried out, that in less than a dozen years from its foundation the prices of the best animals exported had risen to fully double those of 1830, and by 1850 the prices had tripled.

During the first twenty years of the Jersey Society the best animals were discovered, so to speak, and were distinguished by their awards; the best "families" among the cattle became known, "a spirit of industry and emulation" was aroused, and not only

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were the cattle as a breed improved, but the food they ate, the stables they occupied, and the care they received, all felt the good influences of the Society.

It was just at this auspicious time—when the poorer animals had been put aside, when the leading animals and the leading families were easily recognized, and, if money enough was offered for them, could be bought—it was just at this time—1853, 1854, 1855—that the early American importations were made. Since those days many Jersey cattle have been imported to the United States; much intelligence and much money have been devoted to the selection of these cattle, and on numerous occasions the first-prize animals of the Island have been brought across the Atlantic. But it may be said with truth that no better animals have ever been imported than those which came to us twenty-five and thirty years ago.

Though the change of climate and of foods was certainly great, these cattle adapted themselves promptly to the conditions of their life in New England and the Middle States, and within the past few years they have successfully penetrated to all parts of the Western and Pacific States, as well as to those lying about the Gulf of Mexico, and in Canada and Cuba also they are well established. They have in this country, moreover, not only retained the peculiar and valuable characteristics of their race—the great yield of fine butter—but they have, as we shall see, exceeded the best performances of their race in the Island of Jersey.

In 1868 the American Jersey Cattle Club was established. This society has done vigorous and successful work in guarding the purity of the stock and in extending the knowledge of the merits of this breed. These merits were not, at first, either widely or willingly recognized; and the Jerseys—or as they were then and are sometimes now wrongly called Alderneys—were seldom seen except upon the lawns or in the stables of men of wealth. Gradually, however, the reports of the great annual yields of butter made by cows of this breed roused the interest of practical farmers, and the growing demand for the butter of these cows further increased their popularity; and soon the little cow which had been laughed at as an expensive and foolish luxury, became to practical breeders of butter stock an absolute necessity. In fact, the growth in numbers and in value of this breed of cattle in this country during the past eight or ten years has no parallel in the history of thoroughbred stock. A dozen years ago Jersey cattle were not seen at the shows; half a dozen years ago they were shown, but with no expectation of rousing much interest, much less with the expectation of winning prizes, for none were offered for this despised breed; three years ago, at large fairs, Jerseys were not classed with or judged according to the rules which govern the exhibition of thoroughbred cattle. To-day, in nearly every State of the Union, the Jerseys shown outnumber any other breed upon the grounds, and in some States they outnumber all other breeds; it is about the stalls of this breed that, to-day, the largest number of interested spectators gather; and this breed during the past year has, in the average amount realized at public auction, taken its position at the head of all others in the United States.

In beauty of form and color, in gentleness of disposition, in length of life, they have no superiors; in amount of butter produced in a year they have no equals, and in color, flavor and texture, the butter of this breed is now accepted in all markets as the standard of excellence.

The cows of this breed weigh about 800 lbs. Their eyes are large and mild, the head small and lean, the face dished, the horns small, incurved and yellow, the ear small, thin and yellow inside, neck and throat straight, thin and clean, back level and broad at loins, barrel well-ribbed and deep at flanks, legs short and small, tail fine and long, hide thin and mellow and yellow, hair soft, udder very full forward and behind and free from hair, teats squarely placed, milk veins large and long, escutcheons large and full on thighs, disposition kind and quiet. The general appearance

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of the Jersey, as compared with other breeds is not only small, but thin. The colors include all shades of fawn, drab, brown, and gray, either in one uniform color, or varying in shade with different parts of the body or broken in patches of white. Unfortunately there was for a time a "fashion" in colors in England and this country, and breeding with reference to a particular color, or for a uniform color, undoubtedly interfered with the more important occupation of breeding for butter. Happily this vagary has almost passed away. The color of the hair of a Jersey has no connection whatever with the butter yield as to quality or quantity, nor is it any indication of the vigor or of the disposition of the animal. The Jersey is a good eater and a good "digester," but when compared with what she produces she does not eat more than the cows of other breeds. The rations most favorable in this country for the health of the cow, the development of the calf in the womb, and the production of the largest amount of the best quality of butter, are about 20 pounds of hay, 4 to 6 quarts of a mixture of equal weights of cob-corn meal and wheat-bran, and half a peck of carrots and beets chopped up and mixed with the grain. This for a Winter ration. In the Summer it is well to supplement the pasture with a grain fodder of oats and peas, millet, sweet corn stalks or barley, according to the season, and to this a couple of quarts of corn and wheat-meal may be added.

A larger grain ration than the cow can at once direct toward the warmth of the body and the supply of fat in the udder will occasion a tendency to put fat on the carcass, and this tendency encouraged will be fatal to the greatest butter yield. From the start care must be taken to give the Jersey enough food to keep it warm and keep it growing if young, and keep it steadily developing the fœtus and manufacturing butter, if mature; but all food beyond that required for these purposes will be worse than wasted, for it will divert the Jersey from the butter-producer, in which character she is a success, to the beef-producer, in which role she always must be and always should be a failure.

Great care should be exercised with regard to high feeding before the cow calves; with cows of this breed it is well to withdraw all grain for at least six weeks before the calf is born. While it is important to give the cow food sufficient to supply all of her needs and those of the almost fully developed fœtus, yet it should be remembered that at this time the cow is taking comparatively little exercise, she is giving little or comparatively little milk or butter, and the fœtus, until it comes into the world, requires less than one ounce of nourishment a day; all of these needs good hay and perhaps a few roots will supply; grain will unduly rouse the system. Our object should be to prepare the cow as far as possible for the great change which her system will undergo when all the energies of her organism are turned suddenly from the nourishment of the fœtus in the womb to the nourishment of the calf from the udder, and this strain, great in all cases, is vastly increased, it should be remembered, in the case of artificially high-bred cows who pour into the bag enough milk to supply half a dozen calves instead of the one which nature has made them to bring forth. It cannot be too strongly urged that in order to avoid the too frequent cases of death or injury from milk fever and garget *all grain* should be removed for a month at least before the period of parturition, and given sparingly for at least a week thereafter.

It seems to be better for the dam and no worse for the calf, if the latter is removed at the end of forty-eight hours. For the first two or three weeks let whole warm milk be given; at the end of this period skim milk, warmed, may be substituted; this may be given up to six or eight quarts a day until the calf is well established in the habit of eating grass or whole oats and hay.

The Jersey has been brought to her present state of excellence by not a little in-breeding. "In no other way have our present well-known breeds of live stock been established than by in-breeding;" in no other way can the desirable characteristics be

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fixed. It has been well said that "this system of breeding has a refining influence; it develops the good and desirable qualities, and it fixes them; it undoubtedly also, in many instances, develops the weaknesses and the undesirable qualities, and this renders it necessary that the breeder should have considerable experience before attempting this department of breeding;" but just as certainly as this in-and-in breeding has been an important agent in bringing the Jerseys up to where they now stand, just so certainly must it be depended upon in our efforts toward carrying them to a yet higher position.

That this breed of cattle has reached its best performance no one thoroughly familiar with them in their past and present condition will be willing for a moment to admit. Though they to-day as a class surpass all other breeds in annual butter yield, there are no substantial indications yet visible that the limit of this production has by any means been reached. On the contrary, not a month during the past year has gone by without bringing reliable reports of increased individual records, and of increased averages for herds. Nor are the best reports received from any one section of the country; Northern New England and Southern New York each report nearly eight hundred pounds of butter as the amount produced by one cow in twelve running months; Eastern Massachusetts gives us a cow with a record of over seven hundred pounds in a year, and from Illinois and Tennessee we are receiving reports of great yields.

Nor does the Jersey, who gives seven or eight hundred pounds of butter in twelve months, and who also develops a calf during this period, show any falling off in vigor of constitution either in herself or in her offspring; in other words, though she produces tenfold more butter in a year than she would do in a natural state, she gives this increased yield without drawing unduly upon any of the necessary functions of her organization, it is a legitimate result of systematic thorough breeding.

We claim then that the Jersey is the *most profitable butter producer*. She makes more butter than any other cow; this butter is of a better quality than that produced by any other cow; she is as long-lived as the cow of any other breed, and she comes into profit earlier; she is as economical to feed, as easy to "handle," and more easy to make butter from, giving more butter in her milk in proportion to the other elements, making, in particular, a great saving in the amount of water to be milked from the bag, to be carried to the milk-rooms and to be provided with pan surface—this is no unimportant characteristic, from a practical point of view; no small amount of time, labor and material is thus saved in the course of a year.

The Jersey not only gives richer milk, but in her milk the "globule" is larger than in the milk of other breeds; in consequence of this larger globule the cream rises quicker, and hence is exposed a shorter time to injury from fermentation, from odors, and from dust and insects.

The larger globule, with its thinner envelope, churns more quickly and more satisfactorily, and is better adapted to all varieties of churns.

It may also be said that cream cheese from the milk of this breed are highly esteemed; and Jersey veal brings a high price in the market.

To sum up:

First.—The Jerseys are a thoroughbred and well established race. As far as there is anything of value in systematic breeding with a particular end distinctly in view, purity of blood and a long line of worthy ancestors, and favorable conditions with respect to food and climate, the Jerseys compare favorably with any and all other breeds.

Second.—They possess as fully as any breed the power of transmitting their desirable qualities to their offspring. They are thoroughly responsive to in-and-in breeding when intelligently carried on for the purpose of intensifying and perpetuating their peculiar powers as butter-producers. The leading Jersey cows in America to-day

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show in their pedigree much close breeding among their ancestors, and they are better than any of their ancestors.

Third.—Having smaller bodies than any of the other leading breeds, they require less food to build up and develop these bodies while they are growing, and they require less food for the repairs of their bodies when they have reached their full size.

Fourth.—They come into profit at least a year earlier than other breeds, and thus make a saving to their owners of a year's food, handling and housing. This is no small item considering the labor, the expense and the risk attending the younger years of valuable stock.

Fifth.—They have shown a power unequalled by any other breed of adapting themselves to the various climates and to the varieties of foods of all parts of the United States.

Sixth.—No cattle in this country are more quiet, gentle, hardy, prolific, or long-lived.

Seventh.—They are the most persistent milkers of any breed. They seldom go dry for more than six weeks; many instances are on record of cows giving half a dozen calves in as many years without ever ceasing to give a good yield of milk.

Eighth.—They make more butter from a given amount of feed than the cows of any other breed. Two pounds and a quarter of butter a day is not an uncommon yield for a cow in the Winter receiving a dozen pounds of dry hay and two pounds of corn-meal mixed with two pounds of wheat shorts.

Ninth.—They will make more butter in twelve running months than will the cows of any other breed. Several cows in this country made in 1880 over seven hundred pounds of butter, two of them nearly eight hundred pounds, and none of these cows are believed to have yet reached the full limit of their powers. Records for herds of 300, 350 and 400 lbs. are to be found in many States.

Tenth.—Their butter has a higher color in Winter, as well as in Summer, than that of any other breed except the Guernsey.

Eleventh.—The milk, the cream, and the butter of the Jersey has a richer taste, and a more lively and agreeable flavor at all times of the year than that of any other breed.

Twelfth.—The butter of this breed, in texture and grain, has no equal. Its firmness, its freedom from salvy character in the heats of Summer, is particularly noticeable.

Thirteenth.—There is no breed which has been crossed upon the common stock of the United States with more immediate or more satisfactory results. It is an important fact in cross-breeding that the most favorable results are obtained where the bull belongs to a race whose bodies are smaller than are those of the race to which the cow is allied, and the same is true where the male represents a race older and better established than that to which the female belongs; both of these favorable conditions exist in the case of the Jerseys and our common stock.

Fourteenth.—The Jersey breed is surpassed by no other in respect to the opportunities it offers for the efforts of the practical or the experimental breeder.

RICHARD GOODMAN, JUN.

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DAIRY CATTLE.

BY

CORNELIUS BALDWIN,

NELSON, OHIO.

It may be safely asserted that no other domestic animals are of such importance to mankind and civilization as those of the bovine race. None others supply so large a number of wants in both luxuries and necessities. It is also true that those cattle are most valuable which produce milk in large quantity, and of good quality, particularly if they also have a fair degree of fitness for the shambles, in form and size. In all breeds or kinds a certain number are superior for the dairy, while the remainder represent every grade and shade of mediocrity and inferiority.

That some of the breeds or kinds are superior to others for dairy purposes is certainly a fact, but it is believed that the difference between them is not so great as has been generally supposed. It is true that those cattle which are practically superior for the dairy, no matter of what kind, nearly always possess what is called "milk shape" or "milk form," while those which are of the "beef form" or "beef shape" in great perfection are, with rare exceptions, undesirable for the dairy. It is unfortunate that this natural difference exists, but it seems unavoidable.

Within all the breeds there is to be found both the "milk shape" and "beef shape" in greater or less numbers, notwithstanding the persistent efforts of the breeders to make all conform to one shape or the other.

Phenomenal cases in the production of milk and yield of butter can be shown in individual animals and "family strains" of any breed. In fact, size and weight being considered, and taking those large yields as the rule by which to compare breeds for dairy use, they will be found about equal. But this is certainly not true. Careful examination of large numbers of cattle will disclose the fact that large yields of milk or butter belong to those animals having the "milk shape," but it will also appear that a large minority of cattle having good "milk shape" will range from medium to worthless for the dairy.

Farmers and cattle breeders generally have for a long time given particular attention to the "milk shape" in breeding dairy cattle, and have succeeded as far perhaps as is possible in using that as their almost only guide. As a result of this method we find several breeds possessing the "milk shape," but which do not, upon actual test of a really average lot, prove as satisfactory as might be desired or expected by the amateur.

A great degree of uniform excellence for the dairy has not yet been attained in any of the breeds except that the Jerseys show uniform excellence for making a choice article of butter. Notwithstanding the foregoing may seem like serious charges against the several thoroughbred races of cattle, the writer wishes it distinctly understood that all of the different breeds are of great advantage and value, in that the cattle of the future will be largely the descendants of the best animals in the different breeds of the present, and the great improvement which is yet likely to take place will be an outgrowth from the thoroughbred races of the present. The

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question arises, can the present breeds of dairy cattle be greatly improved upon by any additional methods in selecting animals to breed from, and can uniform excellence be attained in nearly all of the individual animals that shall constitute the future herds of the thoroughbred races of dairy cattle? It cannot be otherwise if those most powerful to bring about such results will improve upon the opportunities and knowledge extant upon this subject. A careful "weeding out" should occur all along the line, and the saying that "An ill-bred thoroughbred is worse than a mongrel" should be rigidly put in practice. Thoroughbred cattle should only be bred by those having skill and knowledge in the business, and purchasers should be careful to buy of such. Careful attention must be given to certain physiological peculiarities and developments. Among these are the escutcheon or milk mirror, with its many differences of form and value; the lacteal veins, of which there are as many as eight distinct variations in kind and value, as well as other veins in the vicinity of the udder; the absence or prevalence of a deposit of calcelous structure upon the ends of some of the bones, which may be detected by feeling with fingers' ends; the hair, eyes, horns, color, size, shape and quality of flesh.

It is much easier to succeed in breeding superior cattle for the dairy than superior excellence for the shambles. Great possibilities are within the easy grasp of the prominent cattle breeders of the world. Like begets like, it is said. This is not strictly true; but like begets a strong similarity. No two things in the world are alike so far as man has discovered. These variations may run in the direction of degeneracy even in the most perfectly bred animals, and the careful eye of the professional cattle breeder is necessary that too great distance is not made in the wrong direction. The foregoing opinions, which the reader may think to be rather positive or pretentious, are held by the writer after years of careful observation with thoroughly practical tests in this branch, or twig, of science, and are given with a slight hope that they may be of some practical importance and interest to farmers and professional cattle breeders, and thereby to mankind generally.

CORNELIUS BALDWIN.

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HOLSTEIN CATTLE.

BY

CHARLES HOUGHTON,

BOSTON, MASS.

The race of large improved black and white cattle, known in America as "Holstein Cattle," are animals, or the descendants of animals, imported from North Holland or the neighboring provinces, having been selected there with the greatest care in reference to purity of blood and the fine qualities of each individual animal.

Previous to and for some time after 1871, Mr. Winthrop W. Chenéry of Belmont, Mass., was the principal if not the only importer of Holstein Cattle for purposes of improvement.

In March; 1871, about ten persons, to whom Mr. Chenery had previously supplied one or more Holstein animals each, at his suggestion united with him in an association called The Association of Breeders of Thoroughbred Holstein Cattle, with a constitution and by-laws and a register of all the pure-blooded animals of that race owned by them. The principal object of this association was and is to keep and preserve a register of animals known to be of pure blood, and of their progeny, including future importations.

At that time the persons uniting in the association knew of no name by which this race of cattle were generally known in Holland and the neighboring provinces. They had been usually called "Dutch" or "Holstein" by Mr. Chenery and his associates.

In 1864, Mr. Chenery was requested by the Department of Agriculture, at Washington, to contribute an article upon the cattle in question for publication in the Commissioner's Report. The paper was prepared and forwarded to the Department with the title of "Dutch Cattle." In due time the article appeared in the Commissioner's Report with the title changed from "Dutch" to "Holstein Cattle." This circumstance, together with the fact that no other name more appropriate could be suggested, decided the question of name, and Holstein was adopted.

Since then the association has increased its membership to include about fifty persons. It has published four volumes of the "Holstein Herdbook" in which, and the manuscript for the fifth volume, is a list of about six hundred and thirty bulls and about eleven hundred and twenty-five cows, distributed among five hundred owners residing in nearly all the States of the United States, the larger herds being in Massachusetts, New York and Illinois.

Large additions to the number of Holstein cattle in the United States are being made by frequent importations, as well as by the natural increase.

They are easily acclimated and grow as large as in their native country. The descendants of animals imported by Mr. Chenery fifteen years ago are equally as fine as the best selections made in Holland this year.

The bulls are gentle and docile, and excellent workers in the yoke, and the cows are large milkers, far excelling in that respect all other breeds.

They are easily fattened, and males often attain a weight of two to three thousand pounds, females ranging from twelve to twenty hundred pounds.

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There is considerable demand for both males and females for breeding purposes, enough to take up all the importations, amounting to more than four hundred in 1879, and the natural increase at prices affording a reasonable profit both to importers and breeders. It is a notable fact that half-breed heifers sired by Holstein bulls bring twice, and often three times, as much as the grades of any other breed will sell for, and this fact is perhaps the most reliable indication of the estimation in which Holstein cattle are held by American farmers who have had experience with them.

CHARLES HOUGHTON.

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IS IT CHOLERA THAT KILLS OUR HOGS?

BY

BENJAMIN ROSE,

PRESIDENT OF THE CLEVELAND PROVISION COMPANY,

CLEVELAND, OHIO.

Please let me call your attention to a little personal experience I had in regard to the above question. I have in Leavenworth County, Kansas, an experimental farm, and among other animals raised are hogs. On returning home one day, after a short absence, I found four hogs dead, and calling on my overseer for an explanation, he informed me they had died of "Cholera;" but as they had shown a perfectly healthy condition previously, I investigated the matter and found he had neglected to give them proper bedding or comfortable place to lie in, and a cold rain had come on in my absence and made the yard very muddy. A few of the hogs having a dry place were lying down; the others not finding one, only where the first already were, commenced to lie down close to them, and others to lying on them, until there was a pile of hogs three or four deep in the middle, with the result—four dead hogs from smothering.

Any person who is familiar with raising or handling hogs in large numbers, perfectly well understands that more hogs are lost from the above cause than any other. Hogs will pile up whenever the yards or pens are wet and muddy, if the weather is at all cold, and also in cold freezing weather they will do so to keep warm, and persons having charge of them, to screen themselves from blame, are apt to charge it to that convenient word, "Cholera." Undoubtedly the principal cause of the loss of hogs on our Western farms is to be attributed to want of housing and general care and other causes incidental to all young animals.

It seems to me there is no place in the world where hogs can be raised so free from disease as on our Western farms, where the principal feed for them is grain, with pure water to drink, and entirely away from the refuse and garbage of cities.

BENJAMIN ROSE.

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TRICHINA SPIRALIS.

BY

H. F. ATWOOD,

OF ROCHESTER, NEW YORK,

LATE SECRETARY AMERICAN MICROSCOPICAL ASSOCIATION.

"Where ignorance is bliss, 'tis folly to be wise," but where ignorance and prejudice tend to interfere with the sale of so important an item in our American commerce as pork, then it is the reverse of bliss; and, ignoring the interests of "board of trade" gamblers who are "short" on deliveries, we should try to arrive at a better understanding of a subject that is attracting so much attention at the present time. I refer to the "*Trichina Spiralis.*"

An editorial in the Liverpool *Mercury* of February 21st may be taken as a fair sample of English knowledge of Trichina; and, when a newspaper of so high standing teaches such erroneous ideas, can it be wondered at that the public feeling can be so easily manipulated by home producers, who are bending all their energies to keep away American competition?

I quote from the editorial, as follows:

"A case of Trichina just reported from Kansas describes the symptoms of the disease when it attacks the human family. The victim is a farmer. He had been ill for some time, and became much reduced in flesh. Upon consulting a physician, trichinæ were found; worms were in his flesh by the million, *being scraped and squeezed from the pores of the skin.*" (Italics mine.—H. F. A.) "They are felt creeping through his flesh, and are literally eating up his substance. The disease is thought to have been contracted by eating sausages. Trichina Spiralis may be conveyed to human beings, it is thought, by the gross adulterations used in the manufacture of butter and cheese, of which there is some exportation to England. The former is adulterated with lard and grease, which in many cases are taken from the places where hogs die of diseases, and are then rendered into grease, glue, etc."

The absurdity of the above can be best realized by those having some knowledge of the natural history and habits of the parasite. I will endeavor to outline in a brief way some points that I hope may not prove uninteresting to the readers of this Journal.

About the year 1832 some surgeons, in a dissecting room in London, were troubled by their knives being dulled by some minute mineral particles in the muscles of a cadaver that they were dissecting. Examination with a miscroscope revealed the fact that the particles were minute oval bodies, composed of carbonate of lime, and each containing a minute spirally coiled worm. Prof. R. Owen of the British Museum, to whom they were referred, named them *Trichina Spiralis.* For several years subsequent to this it was not known how they came into the human muscles, and I believe that in Germany it was first demonstrated that "Trichinosis" was caused by eating raw pork. A great many trichinæ may be present in the muscles of a human being without causing the least inconvenience, or even the slightest suspicion of their presence. In the case of their first being found, the cadaver was that of a man who had died of a cancer, and the fact of the carbonate of lime cysts being so hard was (with our present knowledge) conclusive evidence that he had carried them around for a long

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time. Eminent authorities in the old country have shown that from two to three per cent. of all cadavers examined miscroscopically are found to have trichinæ in them.

This would indicate that a great number must be ingested at once in order to produce fatal results.

Where the hog procures the parasites we are not in position to state. Many writers claim that it comes from eating rats; (they don't state, however, where the rat gets them). My own views are very much at variance with this, and I hope to be able to carry out certain projected experiments which will throw some light on this subject.

Certain it is, that the human family get them by eating *uncooked* pork. When they enter the human stomach they are soon set free from their cysts, where they have been living in a state not unlike that of the pupa of a moth or butterfly. When set free in the stomach, they grow considerably and become more elaborate in structure, and by the end of the third day become sexually perfect. The males at this time will measure about one-fifteenth of an inch in length, while the females, of which there are seven or eight to every male, will measure an eighth of an inch in length. Each female will produce about eight hundred young. They are viviparous. The young are produced from five to eight days after their parents first find lodgment. On the birth of the young the trouble commences; they immediately begin to migrate to their future homes in the voluntary muscles. Their first movement is to bore through the intestinal walls, and this is what causes the first symptons of Trichinosis—an acute diarrhœa. Their tastes seem to vary as regards choice of location, but on one point they all seem agreed—they *must* pre-empt a striated muscle fibre. They travel along through the muscle and finally pierce the sheath of a fibre and coil themselves up. This causes the second symptom of the disease—intense muscular pains like rheumatism. They are foreign bodies in the muscle, and a natural result follows: by cell multiplication a sac or cyst forms around each individual, and as time goes by the carbonate of lime deposit is added.

Should the patient have been strong enough to live through thus far, his troubles are ended, for the trichinæ lodged in his muscles are each in their little tomb; they will eat nothing, nor can they multiply until they should by chance reach the stomach of some animal. The parent trichinæ taken in with the pork, after producing the young, passed along the alimentary canal and were discharged with the feces.

The reader will notice that it is stated that the parasite enters the human stomach in *uncooked* pork. Smoking and salting of meat does not kill the worm, but by careful experimentation I have demonstrated that 140 degrees of wet heat kills them. Hence no evil results can follow the eating of pork when properly cooked.

When it is understood that the parasite is not found in the fat at all, and that heat is kept on the tanks several hours in order to render out grease, it is hard to understand how "Trichina Spiralis may be conveyed to the human family by gross adulterations used in the manufacture of butter and cheese," as described in the editorial quoted from in the *Liverpool Mercury*.

H. F. ATWOOD.

[From Mr. Atwood's article it follows that the parasite never enters or lives in the fat of pigs, and in the commercial process of making lard and fat pork it cannot be transferred to the fat without being killed by heat and steam. This utterly disposes of the whole sensation, so far as the products of pork fat are concerned. The ham, bacon and sausage question is, of course, different; and even with them cooking is a thorough safeguard.—EDITOR.]

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THE MERINO SHEEP OF THE UNITED STATES.

BY

ALBERT CHAPMAN,

SECRETARY OF THE VERMONT MERINO SHEEP BREEDERS' ASSOCIATION,

MIDDLEBURY, VT.

The flocks of Merino Sheep now owned in the different States are descended from importations from Spain; first, in 1802, by Col. David Humphreys, about one hundred, into Connecticut, and in 1810 and 1811 by Consul William Jarvis of Wethersfield, Vermont, and others, of many more, into nearly all the seaports of the United States. These importations comprised selections from all the best and most celebrated of the old Cabannas or flocks of the migratory sheep of Spain at the breaking out of the French and Spanish Wars. At that time these were the choicest and finest wool-bearing sheep of the world; they had been preserved with the greatest care, and, with a few exceptions granted as royal favors, had not been permitted to leave Spain.

The vicissitudes of war and confiscation of estates brought many of these large Cabannas into the market; they were sold in very large numbers—a few thousand were taken to England, and at least twenty thousand brought to this country, within the years 1810 and 1811.

The descendants of the importations by Col. Humphreys had been somewhat scattered in Connecticut and Vermont previous to the arrival of the importations of 1810 and 1811, and the experiments with them had proved so successful that the latter were welcomed on their arrival and sold for very high prices. They were then introduced throughout the Eastern and Northern portions of the Union, and somewhat in the Southern States, but they did not succeed as well there, or become so popular and profitable as in the East and North. In the more hilly portions and colder climate of the New England States they became great favorites, and have reached the greatest improvements achieved in any race or breed in the United States, until it is now confidently believed by intelligent men who are excellent judges of sheep, and who have visited the flocks of Merinos in foreign countries, that nowhere else has the improvement in these sheep for practical, profitable wool-bearing purposes reached so great perfection, and that the best specimens in this country are without rivals, and are capable of perpetuating these excellencies and thus improving the sheep of countries outside the United States.

When these sheep were imported from Spain, the representatives of the different Cabannas varied much in their different characteristics—some excelling in size and constitution, some in large yield of fleece, some were finer and more even in fleece, some were more fully wooled about the head and down on the legs, some had dense fleeces, some less dense but longer in staple, some had a great abundance of yolk or oil, and while some were comparatively smooth on the skin others were covered with large folds or wrinkles, especially on the neck, and in some cases over the entire body.

The more intelligent and successful of the American breeders, by taking advantage of these varying excellencies, by judicious crossing and careful selection, intermingled the blood of these different Cabannas and bred up a race of sheep that combine in a

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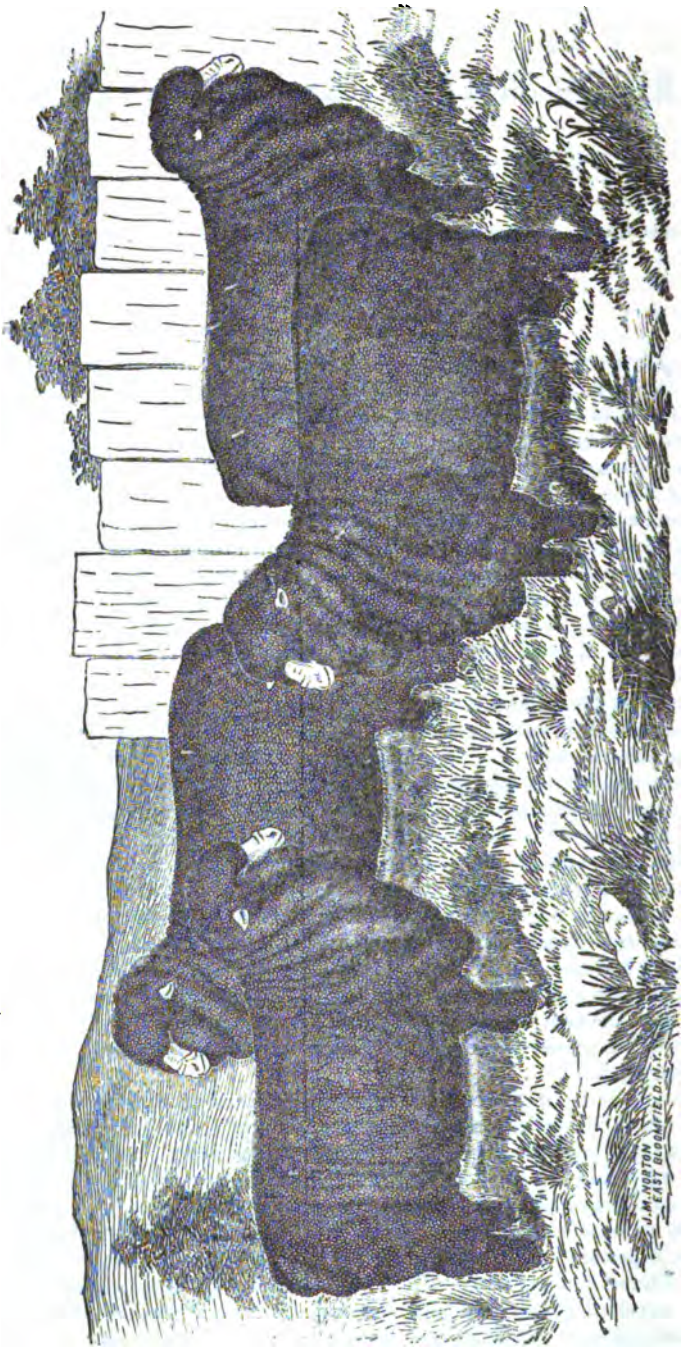

CENTENNIAL PRIZE EWES.

These Ewes, with Ram "Centennial," were awarded the Grand Prize offered for "the Best Flock of American Merino Sheep of any age," exhibited at the Centennial, Philadelphia, 1876.

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marked degree these various excellences, and from which the undesirable qualities of some of them have been eliminated.

Some of the improvements that have been accomplished will now be noticed. The sheep as imported from Spain sheared only about 7 per cent. of unwashed wool to live weight of carcass; indeed, selected specimens rarely exceeded that, while the average yield was much less. At the present time whole flocks shear more than twice as much, and the best specimens from 20 to 30 per cent. of wool. In some extreme cases there has been 35 per cent. of unwashed wool to live weight of carcass, the growth of one year.

Three selected imported rams, at a public shearing in 1810, gave a yield of $7\frac{1}{10}$ per cent. of unwashed wool to live weight, while those selected rams shorn in Vermont within five years gave a yield of 31, 37 and 35 lbs. of unwashed wool, that, after thoroughly scouring for the cards, weighed 8 lbs. 6½ ounces, 9 lbs. 11 ounces, and 8 lbs. 13 ounces; the live weights of carcass of these three rams after shearing was 108 lbs., 147 lbs. and 121 lbs. This would give $27\frac{8}{10}$ per cent. of unwashed, and $7\frac{1}{10}$ per cent., of cleansed wood to live weight; the latter it will be observed is the same per cent. of cleansed wool as was given of unwashed wool by the three rams that were imported. Twenty-one rams, from which fleeces or samples were taken to send to the last Exposition at Paris, gave $22\frac{8}{10}$ per cent. of unwashed wool to live weight; nine of this number, whose live weights averaged 120½ lbs., gave an average yield of a little over 29 pounds each, or a per cent. of $24\frac{1}{10}$ to live weight of carcass.

Forty-six ewes, from which fleeces or samples were sent to the same Exposition, cut nearly the same per cent. of wool to live weight; grouped with the twenty-one rams, the whole gave 22 per cent. These sheep were all bred in Vermont. The excellence of their wools is found in the fact that they drew two gold medals, one silver medal, eight bronze medals and two honorable mentions.

One of the gold medals was awarded to the fleece of a ram five years old, which weighed 31½ lbs., cleansed for the cards 9 lbs. 3 oz. The same ram at three years old cut 37½ lbs. unwashed fleece, cleansed 9 lbs. 11 oz.; live weight after shearing, 147 lbs. Other rams, weighing less in carcass, have given a larger per cent. of wool than this one.

The careful and thorough manner in which these fleeces have been cleansed should remove any impressions that may have been entertained in regard to the vast increase in amount of wool. It should not be entertained that the great fleeces have been accomplished at the expense of amount of cleansed wool. Other careful investigations and measurements from many fleeces, and from different parts of the same fleeces, prove that, with this vast increase of wool, a very material improvement in fineness and evenness of fleece has been accomplished.

A breeder of Western New York had the fleeces of his whole flock carefully cleansed; the result was a yield of over four pounds of cleansed wool per fleece—an amount larger than was obtained of unwashed wool from the average of these sheep when imported from Spain. While it is certain that the gross amount of fleece has been so largely increased, records of the yield of unwashed and cleansed fleeces produced by the Merinos imported from Spain compared with those obtained at the present time from their descendants, as improved by the skill of our breeders, assisted by most favorable conditions of climate, soil and location, prove that the ratio of increase has been quite as great in cleansed wool as in gross amount of fleece.

This natural oil or yolk is a very important assistant in obtaining this increase of wool, as well as of great value to preserve the strength of fibre, elasticity, felting qualities and beauty of fleece.

Our best and most intelligent breeders, those that have accomplished the greatest improvements, believe that wrinkles are absolutely essential, especially in the stock

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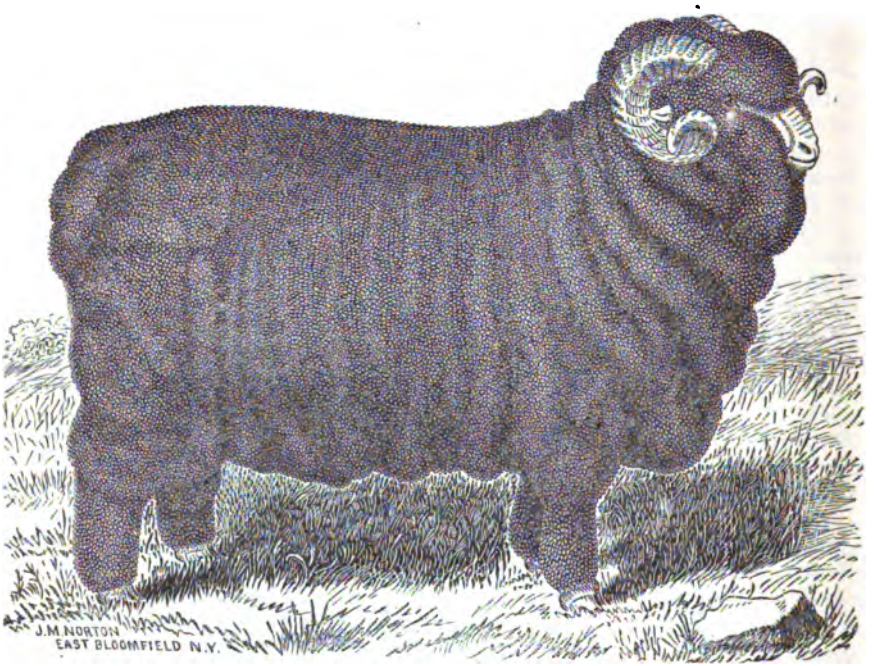
rams, to keep pace with the improvements assured and advance to those not yet attained, but are more than possible in the future. Some breeders that are making marked improvements in their flocks are using rams with excessively wrinkled skins; on the tops of some of these wrinkles in old age will be found *jar hairs*, yet these rams produce through their offspring remarkably beautiful, lustrous fleeces, and, what is of great consequence to the flock-master, fleeces of great weight that return him large profit. The absence of oil and crimp in the wool on these wrinkles gives appearance to the naked eye of a harshness and coarseness that careful microscopic examinations, measurements and tests prove to be erroneous; while in most cases there is a slight difference in the size of the fibres from these wrinkles, and the body of the fleece, it is so slight as to make no difference in its intrinsic value for all common clothing fabrics. In some cases there proves to be no difference in the fineness of the wool on the wrinkles, and in the body of the fleece accurate microscopic measurements have proved this to be the case—in the fleeces of rams, shearing nearly 30 pounds of unwashed, that gave nearly nine pounds of cleansed wool.



"CENTENNIAL."

["Centennial," with four ewes, was awarded the Grand Prize offered for "the Best Flock of American Merino Sheep, of any age," exhibited at the Centennial, Philadelphia, 1876.]

Fibres from many fleeces have been measured, proving that as great improvements have been made in the quality as in the quantity of these fleeces from the heavy wooled Merinos of the United States, the finest approximating to, even rivaling, the finest fleeces from the light-shearing descendants of the old Saxony race of Merinos.

The much greater strength of fibres in the heavy oily fleece gives it a greater advantage in value over the lighter, while the profit to the raiser is several times greater, even though he may obtain a less price per pound for his wool.

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A couple of intelligent Australians, after looking over several flocks of our improved Merino sheep, and examining their fleeces, said to the writer of this: "While our wools are in demand, and we get prices for our best somewhat larger than you, we are obliged to confess that you are receiving two or three times as much money for one of your fleeces as we are for one of ours."

Recent thorough experiments made in cleansing fleeces selected by Australian gentlemen as the best grown in their country with selected fleeces from our Merino sheep grown in Western New York, resulted in a yield of double the amount of cleansed wool and value of the American over the Australian. I have not the exact figures at hand, but a fleece of a Western New York ram, weighing nearly thirty pounds unwashed, gave about eight and one-half pounds of cleansed wool, while a fleece from an Australian ram, shrinking about the same per cent., gave only half as much cleansed wool as the New York ram. The shrinkage of the ewe's fleece from Australia was less than from the Australian ram, but the yield of cleansed wool was proportionately smaller. The result altogether demonstrated a greater value to the manufacturer of the heavy Merino fleeces of this country in proportion to their market price over the Australian wools.

As these improvements have steadily advanced and the Merino blood become more generally diffused in the United States, the average weight of wool per head has increased. During ten years, from 1860 to 1870, the average weight had increased one pound and thirteen ounces per fleece.

The greatest and most rapid improvement in these sheep having been made in the Eastern States, and notably in Vermont, has caused great demand for them in the Western and Southwestern States and in the Territories, and they have become scattered through those sections adapted to fine wool-growing, though in many of those States and Territories there are as yet but few flocks representing the advanced improvements. There are about three hundred and fifty registered flocks in Vermont, one hundred or more in Ohio, about the same number in Michigan, about sixty in New York, fifty or more in Wisconsin, and smaller numbers in Maine, New Hampshire, Massachusetts, Connecticut, Illinois, Missouri, Pennsylvania, West Virginia, Kansas, Colorado and Texas.

There are already six associations that have either issued, or are preparing to issue, registers of these sheep. The Vermont Merino Sheep Breeders' Association has issued one volume with records, pedigrees and histories of two hundred flocks, and is preparing a second volume for which over three hundred flocks have been accepted in addition to those accepted for the first. The Vermont Atwood Club has a membership of about fifty, and has accepted nearly that number of flocks to be recorded in their first volume to be issued in the near future.

The New York Association has already issued its first volume, in which are pedigrees of about forty flocks, and is preparing to issue its second volume, in which an additional number of flocks will be recorded. An association in Ohio issued the first volume or register of the sheep ever published; it had histories of sixty-two flocks. It has not since grown as fast as some of the younger associations, but I am informed it is preparing to publish a second volume. An association in Michigan has a large membership, has accepted nearly a hundred flocks, and promises to soon issue a register. A vigorous association in Wisconsin has a good membership, and has accepted quite a number of flocks for record, and it is presumed will soon issue a register.

These several associations are doing a most useful work by investigating the histories of these flocks of sheep, and determining the justice of their claims to be recorded as pure-bred Merinos descended unmixed from the importations from Spain. Since this work has been done, those who would wish to purchase these sheep have assurance that they have in these registers protection against fraud and imposition; as a conse-

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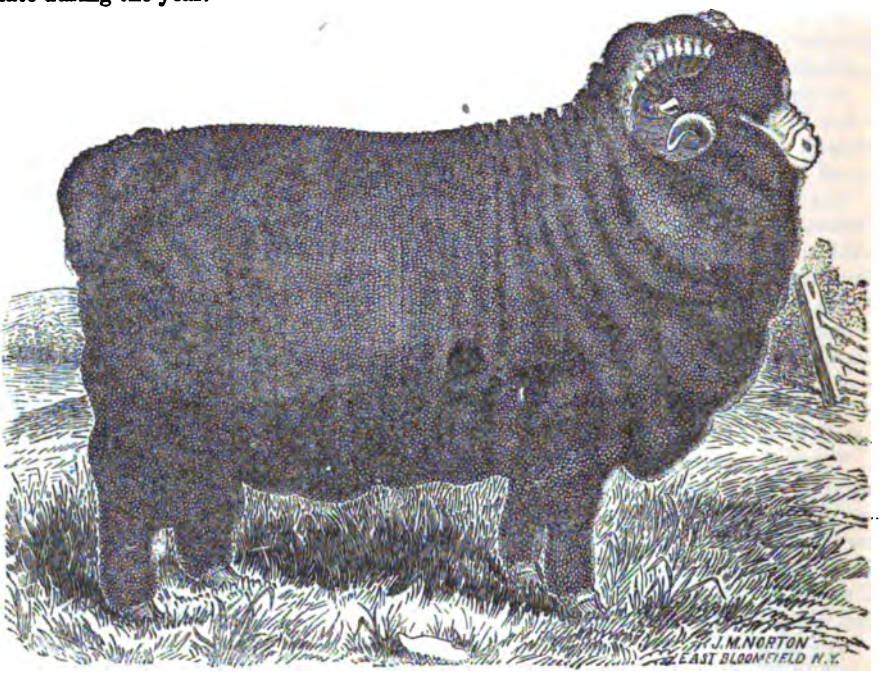
quence, the demand for this blood to start new flocks and improve old ones has greatly increased and the prices greatly enhanced. Selected ewes sell in many instances as high as one hundred dollars each, and in some cases as high as three hundred, and in some extreme cases, for very choice ones, even higher; selected rams from one hundred to five hundred, and some superior celebrated rams from one thousand to two thousand dollars. In the North-Eastern States, where these improvements commenced, and where, favored by great natural advantages, they have been carried to the greatest extent yet attained, there has been very active demand for breeding stock. During the year 1880 over sixty car loads, containing 5,965 of these improved Merino sheep, were sent West and South-West from one railway station in Vermont, and smaller numbers from smaller stations in other parts of the State, though this being the central point of shipment in the midst of the section of the State where these flocks are most numerous, these car-loads probably embrace more than half the number sent from the State during the year.



"BISMARCK,"
Winner of the SWEEPSTAKES at the Centennial, Philadelphia, 1876, for "the Best American Merino Ram of any age."

As these sheep become known there is first a demand for the poorer rams at moderate but remunerative prices, to cross upon the grade flocks of our Western States and Territories. The produce from this cross is a great improvement upon the old sheep of those sections in weight of fleece as well as in quality of wool. The improvement is more marked as the number of crosses is increased. As the improvements become greater, a better and higher priced class of rams is demanded; this has been the case from the first, and the nearer Western States now demand sheep—both rams and ewes—of the highest type of excellence to improve flocks already established and found new ones representing the highest grade of improvement yet attained, and for these highly remunerative prices are paid to the breeders. ALBERT CHAPMAN.

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WHEAT CULTURE.

BY

ARTHUR R. JENNER FUST,

MONTREAL, QUEBEC.

That it is a difficult task to obtain a sufficient supply of farm-yard manure will, it is presumed, be admitted by all who are concerned in the management of land. However useful may be the various artificial manures which are at his disposal, the ordinary farmer, at a distance from large towns as he frequently is, finds himself obliged to allow a large part of his occupation to lie, comparatively speaking, idle for want of the material which habit and the custom of his ancestors and neighbors have led him to consider as indispensable to the perfect production of his various crops.

Compelled as our farmers are, by the rigor of the climate, to depend greatly upon hay and straw for the support of their stock during the Winter months, very little of the latter can be appropriated to the bedding of the cattle. Consequently, the bulk of manure attainable at the end of the season is small, and unless there happens to be a liquid-manure tank the urine is in great measure lost.

Again, the shortness of the season of growth, combined with its intense heat, prevents our grain crops from yielding a due amount of straw—the quantity of litter derivable from Indian corn is almost nothing—and the practice of feeding stock in the yards on green meat during Summer or "soiling," can hardly be said as yet to exist.

From these, and doubtless other, causes, few if any farmers are able to manure even a sixth part of their land annually. In Canada, at least in the province of Quebec, not one *habitant* in twenty has enough dung to dress one-tenth of his farm, and the result is that the average crop of wheat is 8½ bushels an acre! As far as one can judge, the yield of wheat in the United States, though greater than in Quebec, is not much to be proud of. After all, what are 14 or even 15 bushels an acre? Half a crop. And yet we are told by statisticians that the average of the Eastern States seldom exceeds these figures! Is there any cause for this small yield, and is the cause, if there be one, separable from the soil and climate?

It is extraordinary how few farmers are aware that the wheat plant has two distinct sets of roots. They all know that Fall wheat is often drawn out of the ground by the alternate frosts and thaws of Spring, but how few know that nature has provided means by which this eradication may, in the majority of cases, be prevented.

In the accompanying engravings may be seen the right and the wrong way of sowing wheat. The common practice is illustrated in Fig. 1. The seed is scattered broadcast over the plowed surface; the land is harrowed more or less, and the wheat, covered by perhaps an inch of soil, is left to take its chance till harvest.

The reader will observe that in this case the two sets of roots and the pipe of communication are so close together that they are deprived of any chance of exerting their respective powers, the consequence of which is commonly seen by the loss of plant in the Spring.

But look at Fig. 2. Does not the very appearance of the plant argue stability? Do not the lower or germinal roots show like so many stays, exercising a prodigious

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power of retention against the expansion and resettlement of the soil? For my part, I cannot conceive how any one who looks, even carelessly, at these two engravings, can ever again be induced to follow the ancient plan of planting.

Fig. 1.

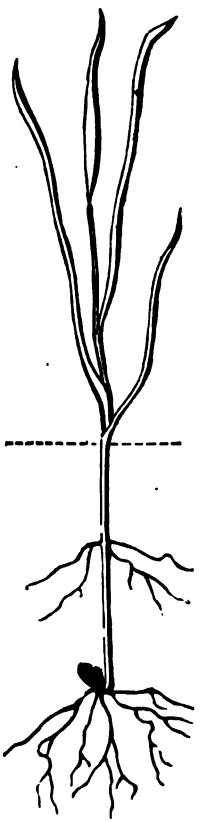

Fig. 2.

By no means, however, is this the only benefit to be derived from deep-sowing. When all danger of frost is over, when the Spring growth has begun, another advantage is apparent: tittering commences. And it is in consonance with observations extending over more than thirty years, that I say: Plant deep, and the number of stems, and therefore of ears, will be doubled. The whole of the tittering proceeds from the coronal roots, and if they are not crowded upon by the germinal roots their propensity to multiply stems is marvelous. Any one passing by a field of wheat, sown in the customary way, just before harvest, will find, if he examine it, that the plant has very little root hold; it is easy to pull it out of the ground. This is owing to the extreme looseness which a long succession of cropping has superinduced. No amount of rolling will cure the fault. Something else is wanting; and this brings me to the real object of this article—the use of sheep in wheat growing.

It is my firm belief that the real reason why our wheat crops only yield half as much as the English crops is, that in England they utilize sheep as grain growers, while we only consider them as wool and mutton makers. I have even heard of an essay on "Sheep as the Scavengers of the Farm," meaning, probably, "pickers up of

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unconsidered trifles" in the form of weeds. Now, though I object entirely to sheep being degraded into "scavengers," I, with admirable inconsistency, admire them greatly in their office of dung-carriers. And with reason; for I was born and bred up to manhood in that part of England in which the whole of the farms are indebted for their very existence, as productive soil, to the sheepfold. Along the margin of many of the lovely brooks (rivers we, in our little island, call them), run the long ranges of the chalk formation, with their rolling hills covered with the shortest and sweetest of herbage, trending back from the valleys on either side towards the sea, and presenting a front to whatever wind may please to blow. Bleak and bare though they be, and dry, the heaviest rain cannot soak them, the hottest sun cannot parch them. This is the country of the Down sheep—of those sturdy, short-wooled, dark-faced, highly flavored muttons, whose honor and glory it is to have converted the barren soils of their native hills into the most productive grain-bearing farms in the Kingdom, and to have furnished the manufacturer with the most useful, if not the finest, material for his looms. And among these hills lived a race of men almost as hardy as the sheep they tended. The last of the old *Kentish Yeomen*, an eminently independent and manly class, were gradually dying off in my boyhood. Many of them could count back their ancestors in the old manor house up to and beyond the Conquest—but, beside the yeomen, there was a large class of tenant-farmers, brought up at home, very little taught beyond mere reading, but as honest, hardworking a set of men as ever the sun shone on. They were behind the times, no doubt, but they knew their business as sheep-farmers, and they farmed and brought into a marvelous state of fertility some of the poorest land in existence. They were, as I have called them, sheep-farmers; they never attempted to fatten sheep, they only bred them, leaving very wisely the other part of the business to the occupiers of the richer lands "below the hill," as the term went.

The soil on the chalk, when first broken up by the plow, is of a very inconsistent, rubbly character. Any grain crop sown in it, however thrivingly it might look during early Summer, would infallibly go down on its back on the eve of harvest; as the Cornishman would say, "It 'ud be scatted all abraad"—just exactly as many a crop will be next July all over the Atlantic coast of this continent. This would not answer, of course, and, whether by accident or not, a cure for the defect was soon found. It was observed that wherever a sheep had rested during the night not only was the crop of a stronger form and of a richer hue, but, while the surrounding parts were all laid this little patch boldly faced the storms and bid defiance to the weather.

How many years ago the regular system of *folding* first obtained I never could find out. It is a very simple business. The sheep go to fold about seven in the evening; the next morning, *as soon as the dew is off*, they are let out, and run on the natural down pasture for an hour or two; they are then allowed to feed on some early forage plant—rye, tares, Winter barley, Winter oats; then a few hours on the downs again; another feed of forage plants, and about 4 P. M. they graze their way along the downs to the fold. The inclosure of wattled hurdles is arranged to accommodate a certain number of sheep, so that the land may be properly and regularly manured. The calculation is that one sheep passing one night on one square yard of land is equal, in money value, to £3 10s. ($17.50) per acre; and it is upon this basis that acts of husbandry, as they are called, for which the incoming tenant has to pay his predecessor, are valued.

Think for a moment of what passes in the fold during the night. The land has been recently plowed; the liquid and solid dejections are therefore easily absorbed; the oil from the fleece forming by no means an inappreciable part of them. The sheep, many weighing from a hundred to a hundred and twenty pounds each, pass eight or ten hours couched on the same spot, and the pressure of their bodies, together with the trampling of their tiny-pointed hoofs, condense and solidify the land in a

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fashion that no roller, not even Crosskill's clod-crusher, could hope to emulate. Well, the day for this style of work is over; it served a purpose, and is gone forever. We can no longer afford to keep wethers till they are three years old; they must now see the butcher—most of them—before their second birthday. Still the principle of folding remains the same; the only thing to be changed is its management. Let us see if we can arrive at the effect by a shorter and more remunerative road than the old one.

On the whole, I suppose, we may consider the feeding of sheep in the open field, throughout the States of New England and Northern New York, to be practicable up to the 15th of November. I imagine that the reason so few turnips are grown in these districts is, first, that it is not the custom of the country; secondly, that wages are high, and the men are not skillful at the work; and, thirdly, that Indian corn is the thing wanted for Winter cattle food. My favorite sheep food requires no hoeing, so the wages question is settled. After a year or two, if the practice I recommend is followed out, the produce of grain will be almost doubled, and the Winter food for stock will not make default. As for the first point, that it is not the custom of the country, that reason, I am sure, will not long be allowed to hinder the improvement, which will be easily perceived after the first trial. I suppose all my readers have seen *rape* or *caleseed*, the *calza* of France. They are pretty much the same thing, and either of them will make sheep ripe-fat without any other food. Cows love rape, and give plenty of rich milk on it; but care must be taken that it is not given them when wet

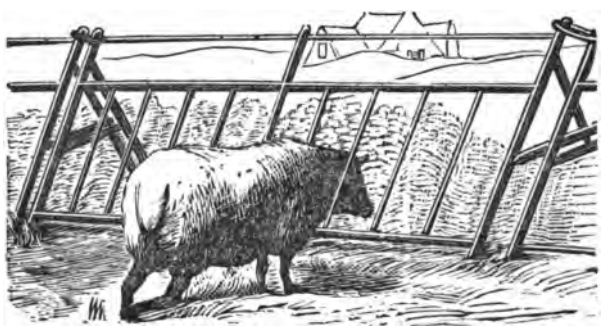

Fig. 3.

with dew or rain. Insects never trouble it; as it is sown broadcast, it requires no hoeing, and no weed can struggle successfully against it. It is grateful for manure, but on good land of a moderately heavy character it can do without it. A few—say ten—bushels of bone meal mixed with as many of ashes will on light soils produce a crop so luxuriant in its lush abundance that the eye is enraptured at the sight. If it is wished that the ewes should *twin* in Spring, a fortnight on rape before they are put to the ram will have the desired effect. In 1853 my Hampshire Downs ewes, 250 in number, gave birth to 397 lambs. Of fifteen that lambed one night came twenty-nine lambs. They had lived upon rape from the 25th of August to the 15th of September. The plant grows so high, and is so sturdy and thick on the ground, that sheep do not trample it down as they do grass or clover, for which reason they may be turned loose into a field of it, though the most economical plan is to divide off a piece every two days or so. I submit a sketch of the best sort of *hurdle*. It is usually made of iron, but I have had them of wood, and they answered famously. A boy can move them with ease. If the sheep are given to jump, it would be a good plan to leave one of the upright bars of each hurdle eighteen inches higher than in the engraving. If a wire is run loosely along

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the top, the sheep may try to jump at first, but after a few attempts the shock they receive on falling back from their spring will so astonish their weak nerves that they will shun further adventures. It is in this way alone that the Welsh mountain sheep, the wildest domesticated animal in existence, can be kept within bounds. A fresh piece of rape, or of any other succulent vegetable, should always be given in the afternoon, say about three o'clock, when the sheep's bellies are pretty full, and the dew has not begun to fall.

The preparation of the land for this crop is simple enough. A good, deep furrow in Autumn should be cross-plowed in Spring; the harrow, grubber and roller, if wanted, will complete the job. The seed, from six to eight lbs. an acre, can be sown by hand or with any of the broadcast machines, covered with the chain harrows, or simply rolled in. It should not be buried more than half an inch deep. If this is finished by the first week in May the rape will be feedable by the 20th June, unless the weather is very unfavorable. Successive sowings should be made every fortnight until the middle of August, and if the earliest piece is not very strong when fed off it may be resown and the sheep run over it again.

As to manures, I have found the following recipe answer well: Take for each acre eight bushels of bone meal; mix them with three times their bulk of ashes or earth; keep the heap damp, and turn it over twice at intervals of ten days. Three hundred of Peruvian guano answers best as a manure on heavy land; as the stem and leaf is what we want nitrogen is the thing. In Kent and Hampshire (England) the farmers burn the grassy borders of their fields and spread the ashes for this crop. It is the first crop grown on the thin chalk soils of Sussex, the whole surface being pared with the breast-plow an inch deep, and the ashes never fail to produce abundant food.

The number of sheep that can be kept on an acre of rape, of fair but not extraordinary quality, may be set down as ten. If additional food be given, as cake or corn, more may be added, but alone it will fatten ten sheep, or feed seven ewes with their lambs. As fast as the land is cleared the plow should follow the fold, covering in the manure and the stumps, and leaving the soil to consolidate in preparation for the ensuing crop of grain.

The expense of this crop, you see, cannot be very great; there is hardly any manual labor required; the seed ought not to cost more than 15 cents a pound, and part of the bones will be left in the ground for the subsequent crops. For the last sowing I should be inclined to take 14 lbs. of Hungarian grass and 4 lbs. of rape; the grass may be touched with the frost, but the sheep will eat it and the rape together, and the dryness of the one will correct the succulence of the other, though sheep never scour on rape even in frosty weather.

We have now got our land manured and consolidated at a small cost, it seems to me; the next question is, what grain crop is to be sown? On all the breaks fed off before the 10th September, Fall wheat will be the most remunerative; after that Spring grain; for choice, barley. How shall we put in our wheat? We left the land lying plowed after the fold. It seems a pity to disturb the closely packed stale furrow. If the soil is level and free from stones we may, after a thorough harrowing, put the drill to work, if we can bury the seed three inches deep. Six pecks an acre of well pickled seed, with the light grains skimmed off in the pickling tub, and the rest well dried with lime, should suffice. But if we have no drill, or if the land is too stony or too rough to insure the depositing of the seed at the regular depth of three inches, we must try another plan. Plow in the seed thus: Harrow the old furrows enough to obliterate them, but no more; sow the grain broadcast and turn it in with a regular furrow of 8 inches wide by not more than 4½ inches deep; it will come up fast enough. There is nothing gained by too rich a looking plant in Autumn; the subsequent tittering after the Spring cultivation will produce as many ears as the soil can bring to per-

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fection, and the yield will be all the better for the wheat not having prematurely exhausted itself.

And next, leave it alone till Spring. The wheat will come up between the furrows, the crests of which, if they lie at the proper angle of 45 degrees, will keep off the cold winds till the snow falls, and when it does come, will be a retaining trough for it. Harrow and roller must not touch it; they would make a mealy surface, which would become a hard crust after rain.

In Spring, if you look at your wheat, you will see that as fast as the snow melts the crests of the furrows moulder down, and of their own proper motion earth up the stems. Now comes the cultivation time. With a set of *medium* harrows, in a perfectly dry time, take two strokes across the rows. Follow this, after an interval of a week, with the heaviest roller obtainable, and immediately afterwards pass a set of *light* harrows over the piece to prevent the land lying with a smooth surface, which, as we saw, tends to become a crust after rain, and to which brewers are indebted for many a sample of *scalded* barley. If you like to sprinkle a hundred weight of nitrate of soda over the wheat on a dewy morning I do not object, but barring accidents you have enough in the land to insure you a good harvest, the produce of which I trust you will be able to sell at a good price.

ARTHUR R. JENNER FUST.

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IRRIGATION IN CALIFORNIA.

BY

ALFRED L. KENNEDY, M.D.

PRES'T POLYTECHNIC COLLEGE, PHILADELPHIA; CHAIRMAN COMMITTEE ON AGRICULTURAL ENGINEERING, AMERICAN AGRICULTURAL ASSOCIATION.

Our crops suffer more from drought than from all other causes combined, and the evil is extending. As the forests disappear before the axe and the fire, the yearly rain-fall may not be diminished, but the intervals between the showers are so prolonged that the earth becomes parched and the plants wither. When the welcome rains return at last they descend in torrents—ample, it may be, for the purposes of husbandry did all the water penetrate the soil. But the earth, thirsty as it is, can absorb but a portion of the storm of bounty; the remainder flows away into the streams and is lost to agriculture. Forests are the regulators of rain-fall, and tree-planting, if generally and judiciously persisted in, may in time shorten the intervals between the rains and render the storms less violent; but the plain, direct and effectual preventive of drought is irrigation. Its neglect entails innumerable failures and enormous losses upon American agriculture, chiefly west of the Mississippi. But the disasters are by no means confined to that region.

The lessons on the art of irrigation, taught by the experience of California, have a value far beyond her boundaries, and should be carefully studied by the farmers in not a few of her sister States. Having the lofty Sierra Nevada just inside her eastern line, and the ridge of hills called the "Coast Range" parallel with and near to the Pacific, most of her territory is constituted of a vast interior valley. The northern half of this great hydrographic basin is drained by the Sacramento, the southern by the San Joaquin, its lakes and branches. These rivers mingle their waters in the bays tributary to that of San Francisco, and reach the ocean through the Golden Gate. During the Summer, drought prevails throughout the great valley, and in its southern third—say south of the Merced River, which receives the waters of the Yosemite—crops, with rare exceptions, cannot be raised without irrigation. Passing southerly over the low rim of the San Joaquin Valley, another irrigated region is reached watered by the Los Angeles, the Santa Ana and the San Gabriel Rivers. These rise in the spurs of the Sierra Nevada—here called Sierra Madre and San Bernardino—and run westerly to the sea, cutting through the Coast Range. Each of them may therefore be said to drain two valleys—an upper and a lower one; the former lying between the Sierra Madre and the Coast Range, the latter between the Coast Range and the Pacific. The number of acres under irrigation in these upper and lower valleys at the close of 1879 was 82,485; in the valley of the San Joaquin, 188,000; in that of the Sacramento and in the foot-hills east of it and the San Joaquin, 22,400.

As the streams in all these districts descend from hills not very remote, the fall is sufficient to admit of the water being diverted from them for irrigating purposes without resorting to the mechanical appliances for raising water employed in Egypt and in Southern Europe. In the San Joaquin Valley wing-dams extending obliquely from one shore towards the opposite, and at an acute angle up stream, generally afford sufficient head. These are numerous in Kern River at the head of the valley, one of the most

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thoroughly irrigated sections, which, being crossed by the Southern Pacific Railroad, is readily accessible. Stone being here scarce and the river not navigable, the head-works at the entrances of the canals are built entirely of wood, on pile foundations well driven down, and sheathed on both sides with two-inch plank. The wings, which are similarly piled and sheathed, extend fifteen or twenty feet into the bank on either side of the canal and at right angles with it. Gates are not used, but posts are set four feet apart, either vertically or inclining backwards at an angle of forty-five degrees. The four feet bays are divided and fitted to receive the weir-boards, which are six to eight inches wide, and slide in grooves. Over the tops of those boards the water flows, and the height is regulated according to that of the river and the volume desired in the canal. Where necessary, a side sluice is constructed, by opening which sand accumulated in front of the head-works may be scoured or flushed out. The natural slope of the ground being too great to admit of the diverted water following it, at intervals, say, of a mile on the canal, weirs or "drops" are introduced. These are similar in construction to the head-works, and by means of sliding weir-boards the water in the canal is kept at the proper height to supply the distributing ditches. Of course the utilization of the water power afforded by these weirs is not neglected.

One of the most important irrigation works, near the Southern Pacific Railroad bridge over Kern River, is the Kern Island Canal, eighteen miles long. It takes its water from the left bank of the stream, where the head-works have a clear width of forty-eight feet and a depth of four. There are two main branches, one of which is ten miles long, width at bottom 20 feet, depth 3 feet, slopes 3 to 1. The other branch, two miles long, supplies the village of Bakersfield and vicinity, and at the village is a fall of nearly twenty feet perpendicular, the power of which runs a large flour mill. The canal and its branches supply thirty-one lateral ditches owned and controlled by individual land-owners, and having a total length of eighty miles. Beside the Kern Island, four other canals, the Old South Fork, the Farmers', the Castro and the Stine, divert water from the river in this vicinity. Their total length is 110 miles, with ditches extending an additional 140 miles. These five canals are capable of supplying 895 cubic feet of water per second, and the area irrigated in 1879 was 22,750 acres. In 1873, six years previously, but 5,000 acres were under irrigation.

Water is applied to all crops, but not at the same time. Some farmers prefer to irrigate in November before sowing their wheat, in order to give it an early start, while others more hopeful wait for Winter rains, and if disappointed, irrigate during the last of January.

Fields of Lucerne are watered about the middle of that month; and in March or April wheat receives one, or, at most, two additional waterings. In May the application to Lucerne is again made; Indian corn receives a share, and the process is repeated if found necessary during June and July. After that month irrigation is not practiced except for Lucerne, late potatoes and garden vegetables. Twenty pounds of Lucerne seed are sown to the acre, and the average yield during the first year is, from three cuttings, four tons, second year six tons; in subsequent years, before putting again under the plow, ten to twelve tons. An acre is capable of supporting five head of horses or cattle, or twenty head of sheep, during the nine or ten months of the grazing season. The average yield of wheat is 27½ bushels, and of barley 32 bushels, to the acre, but in exceptional instances as high as 50 of the former and 90 of the latter have been raised. The quantity of water required, which depends not only upon the kind of crop but also upon the nature of the soil and subsoil, is supplied to consumers at fixed rates by the Kern Island Irrigating Canal Company above referred to, and by other companies in the Valley. Sometimes the irrigators own the canals themselves, as shareholders in a co-operative company, the water supply being divided into as many parts as there are shares. The gates through which the water passes from the

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canal into the ditches are so constructed as to allow each shareholder his due proportion. Again, large landed proprietors have constructed canals, erected buildings, planted orchards and leased the farms to tenants, the latter having rent and water free, the owner receiving one-fourth of the crops. The leases run for five years, and if the land requires clearing the tenant has all he can make the first year. At the expiration of the lease he has the privilege of purchasing in installments at an agreed price.

Methods of applying water to crops vary. A simple one is to surround the fields with ditches, which are kept full of water; another is to run numerous furrows, called carriers, with the plow, these by percolation to distribute the water to crops growing between them on narrow "lands." The flooding of the fields is sometimes effected by ditches which follow the higher ground. From these the waters flow in a thin sheet over the surface, but the uniform application of the water is difficult. If there be inequalities in the surface it collects in the low spots; if the soil or subsoil be unequally retentive, some portions will be too dry, others surcharged. The favorite plan is to divide the land by flat embankments or levees into a series of temporary ponds, the size of which is larger as the surface is more level. In laying out the ground contour lines are run, each level being taken 8 to 12 inches below the next preceding and as far apart horizontally as the slope of the land will allow. Along the contour lines are thrown up flat embankments 18 inches high, and from 15 to 20 feet broad at the base. Over these farm machines can be driven in any direction, crops grow on them, and the long lines of gentle swells, winding, it may be, and more or less parallel, are no deformity. Each space between these embankments is called a check; the levees are therefore check-levees, and the system the check-levee system. Trunks with gates are laid from check to check through the levees, and the water from canal or lateral is first let into the highest check until it covers it, reaching nearly to the top of its lower levee, and but slightly higher than the base of the upper. The water is allowed to stand until sufficiently absorbed, when, what remains is let into the check next below; this, through its own connection with a lateral, is filled, and the process is repeated throughout the series. Jas. D. Schuyler, Assistant State Engineer, to whose able report we are mainly indebted for our facts, gives the cost per acre of check-levees on one-foot contours with about twenty feet base, as follows: Earthworks, $1.64; water or drainage gates, $0.51; total, $2.15; average cost of lateral canals, including necessary regulators and side-gates to supply the lands, $4 per acre—making the total cost of preparing ground $6.15 per acre.

In the counties of San Bernardino and Los Angeles the orchards and vineyards are irrigated by ridging the land into small compartments by means of the plow. The water is first admitted into the highest compartment and retained until the ground is sufficiently soaked. The ridge between it and the compartment below is then broken down and the water admitted, and so on through the series. The supply of water is obtained in the upper valleys of San Gabriel, Santa Ana and Los Angeles directly from streams, although the country is well adapted to the construction of storage reservoirs, but in the lower valleys, near the sea, artesian wells are the source of supply. These three valleys constitute what is called the Artesian Well Belt, a strip of land about 40 miles long, and from 2 to 12 wide, lying between the Coast Range and the Pacific. There are about 600 wells in this belt, the general depth being from 150 to 200 feet and the yield 0.2 to 0.3 cubic feet per second. Some of the wells irrigate from 100 to 200 acres each, but a well which will irrigate 40 acres is considered a very good one. As land without water is worth little or nothing, and as the annual yield of an irrigated vineyard is considered worth $250 per acre when the grapes are grown for wine, and much more when they are grown for raisins, the value of a good well assumes large proportions. Great as are the profits from irrigated vineyards, they are exceeded by those of irrigated orange orchards, each tree of which when in full bearing should yield from 1,000 to 1,500 oranges annually, worth from $15 to $50 per thousand, according to size and quality.

ALFRED L. KENNEDY.

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MILLS' SYSTEM OF ENSILAGE.

BY

FRANCIS D. MOULTON,

PRESIDENT OF THE INTERNATIONAL DAIRY FAIR ASSOCIATION,

NEW YORK.

Many years ago I used to distribute tracts to the poor, the needy, and those supposed to be at least the ungodly, of what is now the wealthiest district of the City of New York. Where the poor are that I visited I do not know, but the lessons of that early time remain with me. Each tract I distributed was, I have no doubt, intended to be a short treatise on practical religion: but as I was stoned for this service one day near what was known as "Quality Row," in Forty-second street corner of Fifth Avenue, which old New Yorkers will remember for its absence of quality, I abandoned a work that I began with enthusiasm under the direction of my teachers of the Mount Pleasant Reformed Dutch Church, then located in Fiftieth street near Cato's road.

I saw much of want and misery in the days I speak of, and I could not help feeling, what I have ever since felt, that the bread of life I was appointed to carry around and give away, and often with sincere prayers in its behalf, was, on the whole, a hard and unsatisfactory and unnourishing crust. I have known many good men and good women, able and willing to relieve the sufferings of the poor: but I was led to believe through my own experience, confirmed by the observation of those I allude to, that it was not so much the meal of to-day and the coat for to-day that was wanted, as the way to earn both for to-morrow. I have since travelled much through the manufacturing and agricultural sections of this and other countries for business, pleasure and observation, and have not found, until within this month, what I believed in the end would prove to be a discovery in industry that would make living for the masses sure and cheap with accompanying comfort, education and enlightenment, to be followed with prosperity, enrichment, near neighborhood and good government, and so I propose to tell as briefly as possible of what I found and where I found it.

I found financially prosperous farming made easy; and I cannot do better just here than to quote, with reference to its value, the words of *The New York Tribune*, when the International Dairy Fair was in progress at the American Institute during December, 1878: "There is nothing of better import to the country than financially prosperous farming. It is money-making, without many of the evils which accompany some of the other methods of making money. It is cleanly, honest, and of all good influences."

I found financially prosperous farming made easy at Arrareek farm, in Pompton, New Jersey; and the statement of its owner, Mr. C. W. Mills, whom I have known for many years, will, I have no doubt, be as much of a surprise and delight, to all who read it, as it was to me. The statement was made to me Monday, April 4, 1881. It was that, during the Winter of 1880–81, he had kept one hundred and twenty horned cattle and twelve horses, and should keep them for seven months more, with half the ground feed that would have been necessary if feeding the best of hay instead of the GREEN FODDER, which was the product of thirteen acres of his farm. The two

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pits, or silos, in which Mr. Mills preserved the green fodder, cost him about seven hundred dollars, and the fodder less than five hundred dollars; hay, to answer the same purpose, would have cost him seventy-five hundred dollars; so that, as the grain consumed in either case would have cost the same, the profit was about seven thousand dollars—not taking into account at all the extra price for milk, which was sold at a premium in New York because of its richness.

I walked with Mr. Mills over his farm. I do not want to say that I never saw a poorer one, but I do not think I ever did. I looked at the stock and they were in unusually fine condition—clear-eyed, fat, sleek, and lazy as pets. I tasted the milk and it was the best I ever drunk. In order to ascertain its quality accurately, (by permission of Mr. Mills,) I had it analyzed by Dr. A. R. Ledoux, one of the most reliable chemists in the country, in comparison with the best product of Orange County. Of course I cannot picture the farm in these pages, nor drive the stock through them, but I subjoin the analysis of the milk, which speaks well enough of the condition of the cows and the quality of their fodder.

CERTIFICATE OF ANALYSIS.

NEW YORK, April 5, 1881.

SIR:—The samples of milk marked I and II, and submitted to us for analysis, contain:

	I.	II.
Water	89.85 per cent.	88.28 per cent.
Butter, Casein, Sugar	9.68	11.02
Ash	0.47	0.70
	100.00	100.00
Specific Gravity	1.0259	1.0328

Your obedient servants,

A. R. LEDOUX & Co.

Mr. Mills' was the parcel marked No. 2; the Orange County, No. 1.

Mr. Mills claims with enthusiasm that the system of ensilage which he has discovered and adopted will revolutionize the present system of farming, and so I will, as nearly as I can, tell how he was led to its discovery, and give his reasons for believing in the good he thinks it must accomplish.

The first experiment which Mr. Mills made, and through which he discovered his system of ensilage, was in the Fall of 1876. He was led to it through a blunder committed in undertaking to improve the quality of corn common to the section of the State in which he lives. He tried to hybridize it with a very superior species of Southern corn, and in order to accomplish his purpose planted each in alternate rows in the Spring of 1876. The home corn was fully ripe and ready to harvest when the Southern corn had only begun to develop its pollen, nothwithstanding the latter stood twice as high as the former. Mr. Mills had failed to take into account, at the time of planting, this difference in the time of maturity of the two species. He harvested the home species and left the other standing, trusting that with favorable weather he might be able to harvest it before the frost came, but late in October the frost nipped the leaves while the corn was yet in the milk. There were about 20 acres of it, standing 12 to 15 feet high, and what to do to save it was the question. After thinking the matter over he concluded to dig four or five good-sized pits in a dry gravel bank, line them with straw, cut and place the corn in them as soon as possible, cover it over with straw and plank, and press it down with earth. This he did; the work occupying him about a week. In the Spring of 1877, as early as the frost permitted, he

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opened the first pit and found the fodder in an excellent state of preservation. Not having cut it up when he placed it in the pits, he was obliged to use a derrick with a double purchase and a heavy team of powerful horses to break it out. He found that his animals liked the fodder very much, and in order to consume the whole of it he added to his herd by purchasing a number of cows. In consequence of the blunder in planting his corn, and the success he had in preserving his fodder as the result of it, Mr. Mills says he then and there devised the method which he has since perfected and now has in practical and successful use.

Mr. Mills prepares the soil for planting the corn from which he makes his ensilage, just as he would for an ordinary crop of corn, and puts the seed in about the last of May or the first of June, according to the condition of the season, so that the seed shall not be subject to any drawback from frost or cold. He plants it in drills of about three inches wide, with a space of three feet between each drill, about 20 or 30 grains to the foot, and uses a blood and bone phosphate as a fertilizer to stimulate the young plant at the start. The first cultivation he gives it is by plowing it with the ordinary corn plow, throwing a furrow away from the drills, then afterwards throwing it back by the hilling cultivator. For seed he uses a species of Southern white corn, a kind easily obtainable in the New York market.

The corn is harvested in the latter part of September, when the stalks are fully matured—not dead, but whilst still green in color—and filled with saccharine matter. This stage of growth is indicated by full tasselling and the beginning to ear. The harvesting is done in the ordinary old-fashioned way, by hand, with a stalk-knife, and a sufficient labor force is employed to fill a pit of 300 tons capacity within three days, because it is essential to gather and cut the corn and put it into the silo, and get it under uniform and continuous pressure within the shortest possible time, in order to save all the food properties. Mr. Mills uses two corn cutters, one cutting one-half inch, and the other an inch length, of a combined capacity of 100 tons per day, using steam power for the purpose.

He has two silos or pits, each 40 feet long, 18 feet wide and 20 feet deep, located in the centre of his barn, the walls of which are constructed of a concrete of stone and cement two feet thick, the sides and ends parallel, and the bottom well cemented. Upon the walls, flush with the inside of them, a structure of ordinary boards is built, fifteen feet high, which serves as a feeder to the pit, and which, when both are filled, will compensate for the shrinkage of the mass by compression. When the pit and feeder are filled, the surface is leveled, and sectional covers four feet in width, and in length one inch shorter than the width of the pit, are placed upon it, upon which are placed 50 tons of grain in bags (making 5 tons to each section) evenly distributed. Mr. Mills uses grain for weight because it is convenient. Anything else that can be uniformly distributed would answer. It takes about ten days for the whole mass to compress sufficiently for the covers to be on a level with the top of the pit, and then the feeder can be taken down. Mr. Mills allows no tramping or mussing of the mass, for the reason that he finds that any portion of the succulent stalks subjected to pressure will cause the juice to exude, and immediately upon relieving the pressure the air takes its place in the cellular tissue of the plant, and fermentation results in the body of the mass. The one inch of space between the cover and the sides of the pit is left for the escape of air and ambient moisture; the uniform and continuous pressure forces out the atmosphere and gases—which may have accumulated while preparing the mass for pressure—through the half-inch opening between the cover and the sides, and keeping them out until the pressure is removed.

When this fodder is to be used for the cattle, the bags of grain from the first section of the cover are removed and their contents ground for use, while the fodder lying immediately underneath them is being fed. The fodder is taken down perpen-

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dicularly to the bottom of the pit. While one section is being used the pressure on the remaining sections continues the same, thus excluding the atmosphere as effectually as if each section were a small pit by itself. Thus, one section after another is fed until the whole is exhausted.

The two pits completed cost Mr. Mills about $700. When filled last Fall they contained about 600 tons of ensilage of maize, grown on about thirteen acres of ground, costing, including seed, tilling, gathering and putting into the pits ready for feeding, less than $500. This was the only fodder Mr. Mills used on his farm, not having a ton of hay since he commenced feeding his animals on the 15th of October last. The preserved fodder in the first pit was not exhausted until the 25th of last January, and sustained 120 horned cattle and 12 horses in good and healthy condition a period of more than three months, with less grain or ground feed than would have been required if the best of hay had been used instead of the ensilage. The balance in the second pit will keep the stock to the end of the seven months, as before stated in this article.

The important conditions to observe in order to secure perfect preservation and good fodder are, first, the use of the proper kind of seed ; second, facilities for cutting the fodder and filling the pit as quickly as possible after harvesting ; third, to allow no more tramping, and consequent injury of the mass, than is absolutely necessary to level it off for the covers. As soon as the covers are in place see that the weight is immediately and uniformly applied, and allow no straw or other dessicated vegetable matter to come in contact with or be mixed with the fodder in the pit.

Mr. Mills claims that he is the discoverer of the value of continuous and uniform pressure for ensilage, or the preservation of green fodder, and the originator of the means and method of applying it. He claims that this system of ensilage will obviate the necessity for green soiling in the Summer—a practice which he considers most pernicious, and of the effects of which many farmers seem ignorant. He says the meat of the animals which are fed on it is injurious to health, and their milk is the frequent cause of dysentery and death amongst children ; that the butter and cheese produced from animals fed upon this unripe annual plant are necessarily bitter and unwholesome. In short, Mr. Mills believes that the natural effect upon an animal of eating unripe fodder is to poison its product, because in consuming the unripe feed it eats only poison. Disease is the immediate effect of it on the animal. In the Winter succeeding its use, the farmer finds on his hands ten or a dozen cows that are sick with hollow-horn or some other disorder that he does not know how to account for—not even imagining that it is the result of the green, unripe annual fodder that they have been fed on the preceding season.

Mr. Mills intends to enrich his farm for the cultivation of the sweetest and best grasses, and to keep them in the form of ensilage, cutting them, of course, when ripe for this purpose, and feeding them instead of the coarse fodder which he is now using. He thinks his animals will fare better on 10 tons of such grasses than they will upon 40 tons of the corn fodder ; in other words, that 10 tons to the acre of ripe, sweet grass is fully equivalent to 40 tons of corn. He does not propose to pasture his stock after this year, believing that the same grass harvested when it is in the flower will be productive of more profit than to let the animals eat it when it is just starting out of the ground. And he finally proposes not to sow corn for fodder, but to raise only rich, sweet perennial grasses for ensilage.

A farm of 100 acres ordinarily keeps about 20 cows. On a farm of 100 acres, upon Mr. Mills' system of ensilage, he proposes to keep 300, using 30 acres for ensilage and the other 70 to grow his grain on. From the exceeding richness produced by the manure from so many animals he thinks he can raise sufficient grain on the 70 acres ; that is to say, about 80 bushels of corn to the acre, or 30 bushels of wheat. Heretofore he says that it has required 200 acres of land to pasture his animals, but he proposes in

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future to keep the same number on 11 acres, and keep them for the Winter, to say nothing about grain. And then, instead of planting 10 or 11 acres to winter them, he will plant 25 acres, and winter and summer them on the product. He says he shall keep 150 head of cattle on the product of 25 acres of land the year round, and have the balance of his farm—say 275 acres—to grow grain on. The difference in cost between the maintenance of an animal under the system ordinarily adopted by farmers and that adopted by Mr. Mills, he claims is the difference between $80 per annum and $12 per annum; in other words, it does not cost him over $12 per head to maintain his animals for one year, while it costs a farmer under the ordinary process $80 for the same time.

I am aware that there are many interested in agriculture who doubt the ultimate success of the system of ensilage, and who have expressed a fear as to its effect on the health of stock and the value of their product; but I know of no more practical man amongst them than the gentleman whose views I have quoted. He is a well-known and conservative businessman, a member of the Produce Exchange of New York, and his conclusions as to the system which he is pursuing are entitled to the gravest consideration. That he has no doubt of their correctness is evident. He has demonstrated their value to himself and can certainly show, through the condition of his stock and the value of their product, a reason for the faith that is in him. I hope and believe that the system which I have seen successfully working on his farm will be established as a safe system for the agriculture of this country. From Maine to the Ohio line, including the New England and Middle States, the farmers are bemoaning the condition of their lands, under which they cannot compete with the rich and easily cultivated lands of the West. The Western States, too, are suffering annually an immense loss through the depletion consequent on raising grain for export. How great this depletion is can be clearly comprehended from the fact that the exhaustion of mineral constituents from the soil, namely, phosphoric acid and potash, was equal in value to $100,000,000 in 1879, when the value of the corn crop was estimated at $500,000,000, or 20 per cent. of the value of the crop. Mills' system of ensilage will, in my opinion, recreate the agricultural industry of the East, re-enrich the depleted lands of the West; and I greet it with welcome and thanksgiving, because of the blessing that inheres in it for the agriculturists of this country, and the consumers of the world. The great dairying industry of the country must greatly prosper under this system; butter and cheese can be produced at a much lower price than the present cost, and at more profit, and of much better quality than the best now on the market; and the oleomargarine or manufactured grease now sold fraudulently in conflict with natural butter, and the lard-cheese, will be displaced by genuine butter and cheese of the best quality, both in the home and foreign markets.

To an American will belong the honor and fame of having perfected the system of ensilage, in his discovery of the value of uniform continuous pressure and the method of applying it. His honor and fame will endure and grow brighter and brighter, burnished by laborers working with the energy of enthusiasm in an attractive, honorable and profitable industry, which this discovery has made possible, and from which it has eliminated the discouraging elements of drudgery and uncertainty. But enthusiasm in behalf of Mr. Mills is no reason for withholding recognition and gratitude from one whose experiments in the same direction for thirty years in France have enabled him to do great good—not only to himself, but to the agriculturists of his own country and those of our own who have received suggestions from him.

Auguste Goffart of Sologne, began his experiments on ensilage in 1850, and constructed his first underground silos in 1852; and with the persistence and intelligence of a moral and agricultural enthusiast, has been working in this direction for the development of the agriculture of his own country and the world ever since, in the face of dis-

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couragement, and loss at times that might fairly have excused him for the abandonment of his work. I am sure that no one will hail with greater delight the success of Mr. Mills than will Auguste Goffart. They have worked in different fields, and unknown to each other, but for the accomplishment of the same purpose. The work of Mr. Goffart and his enthusiasm in it, while, of course, begun in his own behalf, has its highest motive in the behalf of others. His farms and stables have always been open to the inspection of the farmers of his neighborhood and country. Speaking of his own work and his ambition in it he has said, "What I have done can be done by thousands of others, and my sole desire, my sole ambition, is to enable them to imitate me as soon as possible." Mr. Goffart was of course obliged to confront those who doubted the success of his system, who told him that he would lose all his stock if he continued to feed them exclusively on maize throughout the year; but he says, "I continued to do it, and all my animals enjoy health without even a shadow of disease." He faced disaster after disaster in the preservation of his fodder: but went on undaunted in his work, and the spirit that went with him is shown in his simple story of the great misfortunes that befell him in 1871. He says: "I returned to Burtin after having taken part in the defense of Paris to find that typhus had emptied my stables by carrying off sixty-three horned cattle out of sixty-four. With Norman bulls, which I had changed every two years, I had created for myself a new and fine race, and my stables were renowned in Sologne. In ten days I lost the fruit of twenty years' labor; the blow was severe, but what was the loss of a few thousand francs compared with the great natural grief which caused all our hearts to bleed? With courage I begun my work again. I purchased for the replenishment of my stable young animals which continually improve, although aware that time would fail me to replace what I had lost. Let us strive courageously. Perhaps the most obscure of the pioneers of agriculture brings you to day an effective means by which you can charm away the dearth of fodder, which is one of the greatest plagues of agricultural industry. Do not deny to this poor but interesting Sologne, the honor of having been the cradle of a system of ensilage that is effectively preservative, and of having given an example that the richest countries will not be slow to imitate. This is my earnest prayer and brightest hope."

The thanks of the Central Agricultural Society of France were unanimously given to Mr. Goffart in April, 1875. The decoration of the Legion of Honor was conferred upon him in 1876; but when this decoration has faded and is entirely forgotten, the memory of him will bear the decoration of the spirit that actuated him in his work, and he will survive long in the grateful memory of those who have followed, and who shall hereafter follow, his example and his method.

Alluding to a pamphlet issued by him in 1873, he said: "My profound conviction is, that the culture and ensilage of maize is destined to cause a complete agricultural revolution. It ought in ten years to double the number of animals supported on our soil. Was this a chimerical hope? God has preserved me from all discouragement on this point. In the last four years the progress that I have made at Burtin has exceeded all my hopes; and upon my reserve of thirty-five hectares (86½ acres), I kept during the Winter of 1876 forty-three horned cattle, and I shall keep during the Winter of 1877 seventy, with the assurance of going much beyond this at the end of 1878. Here are facts more conclusive than any arguments. The great establishment that I have finished, and shall inaugurate in October, 1877 (to which I invite all agriculturists), proves my firm faith in my work. I have spared no pains nor expense to insure solidity in my buildings, in dear Sologne—which may be considered as the cradle of this new industry—and they represent the point of departure of an immense agricultural progress. Perhaps I may, without too much pride, inscribe upon them the words of the great Latin poet: '*Exegi monumentum, aere perennius.*'"

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Remembering his service to agriculture, and the spirit which actuated him in it, the agriculturists of the world would say if they could give voice to their thought—"Inscribe not only, 'I have completed a monument more enduring than brass,' but write under it, for expression of yourself and your motives, the words of another Roman poet, '*Homo sum, humani nihil a me alienum puto,*' (I am a man, and therefore am interested in all that concerns humanity)."

Francis D. Moulton.

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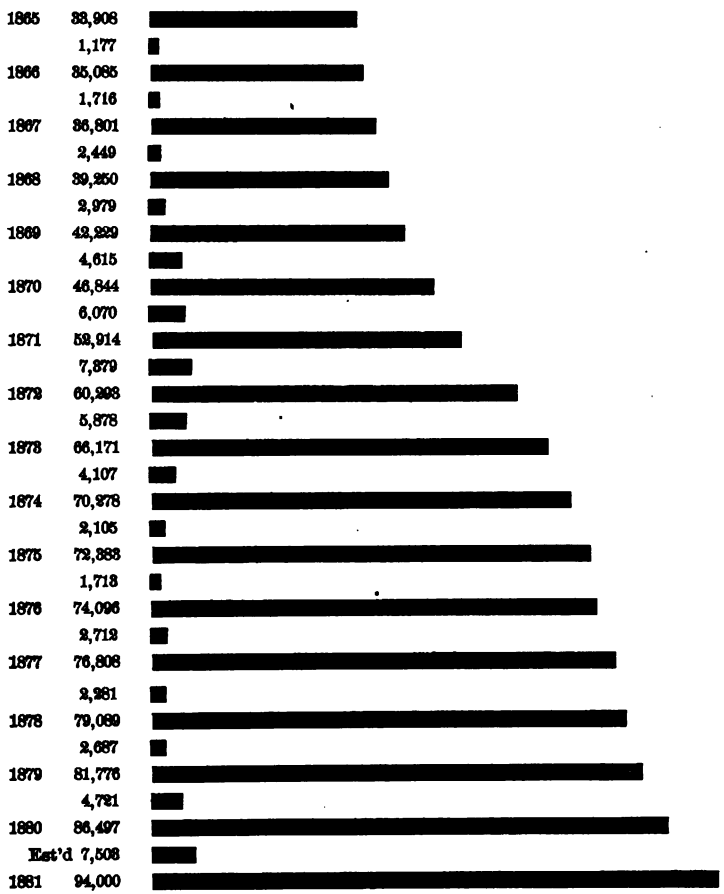
THE RAILROAD AND THE FARMER.

By EDWARD ATKINSON, Boston, Mass.

The close relation existing between these two great factors in society can be made evident in the most striking manner only by an appeal to the eye.

Since the end of the civil war in this country our railway mileage has increased from 34,000 to 94,000 miles. The figures in the following diagram show the miles of railroad in operation on the 1st January in each year, and the black lines show the proportionate increase. Railroad begets railroad, and where we had one mile before slavery ended we now have three.

Miles of Railroad in Operation on the 1st January in each Year and the Miles Added in the Year Ensuing.



The construction of 1881 will probably exceed that of any preceding year.

During the same period the grain crops of the country have increased in the pro-

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portions pictured in the next diagram, the figures on the left showing the number of bushels of maize, wheat, oats, rye, barley and buckwheat produced in each year. It will be observed that the curve of the increase of crops follows substantially the curve of the increase of railway mileage, proving the mutual relation of each to the other.

Grain Crops of the United States.

Year.	Bushels.	Maize, Wheat, Rye, Oats, Barley, Buckwheat.
1865	1,127,499,187	
1866	1,342,097,868	
1867	1,329,729,400	
1868	1,450,789,000	
1869	1,491,412,100	
1870	1,629,097,600	
1871	1,536,776,100	
1872	1,664,331,600	
1873	1,538,892,891	
1874	1,455,180,200	
1875	2,082,285,300	
1876	1,902,831,600	
1877	2,178,984,646	
1878	2,302,254,950	
1879	2,434,884,541	
1880	2,448,079,181	

Authority: Dept. of Agriculture, U. S.

The *production* or leading forth of the fruits of the earth consists of three interdependent *movements;* first, stirring the soil, planting the seed and reaping the harvest — carried on by the engines known as plows, planters, reapers and the like; second, the movement of the grain, and its subdivision by means of the stationary engines known as elevators and flour mills; third, the movement of the food by means of the locomotive engine or the steamship to the point nearest its place of final conversion or consumption.

Each part of the work depends absolutely upon the other, and the common condition of success is in ratio to the removal of obstructions to all these movements. The farmer is free to plant and free to reap; the miller is free to grind and free to sell his service; the owner of the elevator is free to use the *vertical* railway on which he trans-

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fers the grain from the farmer's wagon or from the canal boat to the bin that is to hold it for a time; but the manager of the *horizontal railway* may not move his locomotive engine without being threatened with the obstruction of meddlesome statutes imposed by Congresses and Legislatures in which there may not be a single man who could himself conduct with success the complex work even of a hundred miles of railway.

The world—especially the legislative world—is slow to perceive that all interests are harmonious. If the wheat-grower does not prosper, no grist will come to the mill; if the miller does not obtain an adequate toll, the traffic of the railway will cease; if the dealer cannot obtain his profit, neither the bags of grain or the barrels of flour will be moved from the station where they have been discharged; if the consumer, perhaps in some far distant land, can obtain his food with less labor than he must exert to obtain the means of purchase with which to buy the grain, the whole movement will cease.

Like some of the new processes in grinding, by which the attrition of the particles of grain upon each other works the best results, so in the distribution, the attrition of each apparently conflicting interest with the other defines the service that each has rendered, and thus all are saved from the arduous drudgery that still retards human progress in the places that the beneficent service of commerce does not reach.

Commerce, or the exchange of services among men, promotes abundance; if obstructions are placed in the way, it matters not where, all alike suffer. The railroad removes the obstructions of time and distance. Statutes have been required to enable men to combine for their construction; in order that the utmost freedom should be given even general acts have been passed. It is now proposed to reverse the acts that have enabled railroads to be built, and by other statutes to obstruct their use.

If we desire to know what class has reaped the greatest benefit in this free and vast progress of our railroad system another appeal may be made to the eye.

Chicago being the great market of the world for grain and meat, what has been the cost of moving these staples to the principal port of export, New York? The following tables give the increase of tonnage, and the decrease in the charge upon one of the great lines that unite the two cities.

This line has been selected for the purpose of comparison, because it has not only performed the greatest service to the community, but also because it has been very profitable to its owners. Its traffic also consists mainly of products of agriculture and general merchandise, and very little of coal.

The Lake Shore and New York Central Line has also been taken as an example, because the line has remained substantially the same from 1869 to 1880, while other lines have greatly extended their mileage. The same rule may, however, be established if the same comparison be made of the traffic of the Pennsylvania Railroad, the Erie, or the Baltimore and Ohio lines. The same relative reductions may also be proved from the accounts of all the great lines in the West, if the comparison be made on the main sections between principal points that were in operation at the two respective dates.

Between 1869 and 1879 the traffic of the Boston & Albany Railroad increased 105 per cent., the charge per ton decreased 54¾ per cent., and the earnings decreased 7 per cent.

Between 1872, the year before the panic, and 1879, the traffic of the Pennsylvania Railroad increased 80 per cent., the charge per ton decreased 43 per cent., and the earnings increased less than 3 per cent.

The graphical tables showing these reductions are not repeated, because one example will suffice.

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Lake Shore & Michigan Southern Railroad.—*Actual Tons Moved.*

Year.	Miles.	Tons Moved.	Increase of Tons Moved, Measured by Ratio of Lines.
1869			Consolidated in this year.
1870	1,013	2,978,795	
1871	1,073	3,784,525	
1872	1,136	2,442,092	
1873	1,154	5,176,661	
1874	1,175	5,221,267	
1875	1,176	5,022,490	
1876	1,177	5,635,167	
1877	1,177	5,513,398	
1878	1,178	6,098,445	
1879	1,178	7,541,294	

Lake Shore & Michigan Southern.—*Tons Moved One Mile.*

Year.	Tons Moved One Mile.	Increase of Traffic, Tons per Mile.
1870	574,065,571	
1871	733,670,696	
1872	924,840,140	
1873	1,053,297,189	
1874	999,342,041	
1875	943,236,161	
1876	1,133,834,838	
1877	1,060,005,561	
1878	1,340,467,826	
1879	1,733,423,440	

Lake Shore & Michigan Southern.—*Charge Per Ton Per Mile.*

Average upon all Classes of Merchandise.

Year.	Freight Receipts.	Charge.	Decrease of Charge per Mile.	Comparison of Results.
	$	Cents.		
1870	8,746,126	1.50		
1871	10,341,218	1.39		
1872	12,894,862	1.37		Traffic increased 202 per cent.
1873	14,192,399	1.33		
1874	11,918,350	1.18		Decrease charge per ton 57½ per cent.
1875	9,639,068	1.01		
1876	9,405,639	.82		Earnings increased 22½ per cent.
1877	9,476,608	.80		
1878	10,048,952	.73		
1879	11,200,261	.64		

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NEW YORK CENTRAL & HUDSON RIVER RAILROAD.—*Actual Tons Moved.*

1869	842	3,190,840
1870	842	4,123,000
1871	844	4,532,056
1872	850	4,393,905
1873	856	5,522,724
1874	1,000	6,114,678
1875	1,000	6,001,984
1876	1,000	6,803,680
1877	1,000	6,357,356
1878	1,018	8,175,535
1879	1,018	9,441,213

NEW YORK CENTRAL & HUDSON RIVER RAILROAD.—*Tons Moved One Mile.*

1869	589,362,849
1870	769,087,777
1871	588,327,865
1872	1,020,908,885
1873	1,246,650,063
1874	1,391,560,707
1875	1,404,008,029
1876	1,674,447,135
1877	1,619,948,685
1878	2,042,755,132
1879	2,295,827,387

NEW YORK CENTRAL & HUDSON RIVER RAILROAD.—*Charge Per Ton Per Mile.*

Average on all Classes of Merchandise.

YEAR.	RECEIPTS.	CHARGE.	DECREASE OF CHARGE.	COMPARISON OF RESULTS.
	$	Cents.		
1869	14,066,386	2.38		
1870	14,489,217	1.88		
1871	14,647,580	2.49		
1872	16,259,647	1.59		Traffic increased 289 percent.
1873	19,616,018	1.57		
1874	20,348,725	1.46		Decrease charge per ton 67 per cent.
1875	17,899,707	1.27		
1876	17,598,265	1.05		Earnings increased 80 per cent.
1877	16,424,317	1.02		
1878	19,045,830	.98		
1879	18,270,250	.79		

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That this great line offers no exception to the general rule will also be apparent from the following tables:

Tons Moved Upon all the Railroads in the State of New York.

1870	20,572,212
1871	22,739,447
1872	27,427,415
1873	34,358,119
1874	33,555,595
1874	32,408,547
1876	34,163,958
1877	34,984,781
1878	38,330,573
1879	47,350,174

Compiled by G. R. Blanchard.

Receipts, Expenses & Profits of all the Railroads in the State of New York, in Cents per Ton per Mile.

	Receipts.	Expenses.	Profits.
1870	1.7016	1.1471	.5545
1871	1.7005	1.1450	.5555
1872	1.6645	1.1490	.5155
1873	1.6000	1.0864	.5136
1874	1.4480	.9730	.4750
1875	1.3039	.9587	.3452
1876	1.1604	.8561	.3043
1877	1.0590	.7740	.2850
1878	.9994	.6900	.3094
1879	.8062	.5847	.2295

Compiled by G. R. Blanchard.

It will be observed that the rates of charge pictured in these tables cover all classes of merchandise, and that the charge on grain and meat is, customarily, from one-half to two-thirds the average rate on all the traffic; the less rate being possible owing to the great distances over which these staples are carried.

When we compare the steady reduction that has followed the consolidation of the great lines of railway between East and West (which are but examples of a rule that has affected every great line in the United States), with the prices of the great staples moved upon them, in the markets of Chicago or New York, we shall see that the benefit of very great reduction in the rate charged has been secured by both producers and consumers of the products moved—largely by producers—the reduction in the prices of leading staples being much less than the reduction in the cost of transportation.

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By the kindness of Mr. Joseph Nimmo, Jr., of the Bureau of Statistics, Mr. E. H. Walker, of the New York Produce Exchange, and Messrs. Mauger and Avery, wool merchants, I have been enabled to compile a list of the prices of staple farm products in the market of New York City, from which I have deduced the tables given hereafter.

At the average price of the year, it appears that in the year 1869 20 barrels of Extra State flour, 10 barrels each of mess beef and pork, 100 bushels each of Milwaukee Club wheat, Western mixed corn and oats, 100 lbs. each of State dairy butter, lard, and medium washed clothing wool—9 articles in all—could be purchased in New York City for the sum of $845.58 in currency. The average value of the paper dollar in 1869 was 74.8 cents; the above sum is, therefore, equal in gold to $632.68.

In 1880 the same quantities of the same articles could be bought for $631.32 in gold, a variation and reduction of less than two dollars on the whole.

When we compare the vast changes in all other matters affecting the exchange of products, the stability in the gold value of farm products will be brought into sharp contrast.

Between the 1st January, 1868, and the 31st December, 1880, the following changes occurred:

The railroad mileage increased from 39,250 to 94,000	139 per cent.
The grain crops increased from 1,450,789,000 bushels in 1868, marketed in 1868–69, to 2,448,079,181 bushels in 1880	69 per cent.
The prices of the above-named staples decreased in currency between 1869 and 1880	26½ per cent.

In gold the prices were practically the same.

I am unable to make comparisons between the railroad traffic of 1869 and 1880, because the detailed accounts of the latter year are not yet available. I believe the accounts of the railroads show a very small increase in the cost and charge per mile as compared with 1879, but the prices of products moved increased also.

By a comparison of the traffic of 1870 and 1879, as given in the preceding tables, of the Lake Shore & Michigan Southern, and 1869 and 1879 on the New York Central and the Hudson River Railroads, it appears that the actual tons moved on these two sections of the consolidated line between Chicago and New York, increased on the average of the two lines

The tons moved one mile increased	175 per cent.
The earnings from freight increased only	246 per cent.
The charge per ton per mile decreased on the Lake Shore & Michigan Southern	29.2 per cent.
And on the New York Central	57⅓ per cent.
	67 per cent.

The same changes have occurred in substantially the same degree upon the Pennsylvania Central, Baltimore & Ohio, Chicago, Burlington & Quincy railroads, and all others that constitute the alleged monopolies. On the other hand, all the short lines, and all the *disjecta membra* of lines that ought to be consolidated and are not, show far less reduction in the charge for their service, and little or no profit to the corporations that own them, where their profits depend in any degree on a share of the freight brought from long distances.

Let us now compare statistically and graphically the changes in the prices of leading farm products and the decrease in the cost of moving them. We can then gauge the effect of each change upon our foreign export. It must be remembered that the average price of each product named in this table, except wool, is established at what our excess will bring for export.

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YEARLY AVERAGE PRICES AT NEW YORK.

	1862	1863	1864	1865	1866	1867
Yearly average of gold	113.22	146.06	204.05	157.72	141.55	138.62
Flour, Extra State	5.49 8/45	6.14 17/45	8.62 5/18	8 05 11/18	8 93 1/2	10 74 23/24
Wheat, Mil. Club	1.20 1/12	1.55 17/48	1.97 1/4	1 69 1/24	2.07 3/8	2 41 5/12
Common Western Mixed	.60 7/8	.71 17/48	1.51 17/48	1.19 1/12	.09 13/16	1 64 5/8
Oats per bushel	.35 17/48	.77 1/12	.92 13/48	.74 13/24	55 13/24	.75 5/12
Pork, per barrel, Mess	12.88 13/24	13.61 17/24	33.18 1/4	29.21 7/8	29.04 1/4	22 13 1/24
Lard per pound, Mess	.07 73/480	.10 13/96	.17 35/96	.21 1/96	.17 1/4	12 23/32
Butter per pound, State Dairy	.20	.25	.44 1/2	.36	.45	31
Beef, Mess, per barrel	12.59 17/48	11.79 1/8	17.58 11/48	13.89 7/12	16.31 1/7	17.13 13/24

	1868	1869	1870	1871	1872	1873
Yearly average of gold	139.84	133.70	114.92	111.80	112.47	114.05
Flour, Extra State	9.13 1/24	6.71 21/32	5 55	6.62 3/8	7 03 3/8	6 90 7/8
Wheat, Milwaukee Club	2.14 5/8	1 51 15/16	1.29 3/8	1.51 1/2	1.58 7/12	1 56 1/4
Corn, Western Mixed	1.19 3/8	1.01 17/96	.92	.76 3/8	.67 7/16	.64 5/8
Oats per bushel	.82 5/32	.73 17/96	.58 5/8	.60	48 3/4	.49 5/12
Pork, Mess, per barrel	26.82 7/24	16.41 1/2	26.88	16.46 1/4	13 61	15.25 11/12
Lard per pound	.16 3/8	.18 1/4	.15 7/16	.10 11/12	.09	.08 1/2
Beef per barrel	16.19 17/24	11.41 5/8	13.93	14 00	10.23	9 63 1/2
Butter, State Dairy	.44	.41	.31	.30	.27 1/2	.33 1/2

	1874	1875	1876	1877	1878	1879	1880
Yearly average of gold	111.24	114.90	111.65	104.80	100.90	100	100
Flour, Extra State	5.88 1/2	5.37 1/4	5.13 3/4	6.24 1/2	4.48	4 50	4.73
Wheat, Milwaukee Spring	1.35	1.23 7/8	1.21 3/8	1.50 1/4	1.16 3/4	1.16 3/4	1.24 15/16
Corn, Western Mixed	.89	.82 9/16	.60 1/4	.59 1/2	.49 3/8	.49 3/4	.55 1/10
Oats per bushel, Western Mixed	.62 1/2	.62 1/4	.41 5/8	.42	.32 5/8	.37 1/8	.42 9/16
Pork per barrel, Mess	19.16	21.13	19.63	19.76	9 77	9.88	13 23
Beef, Mess, per barrel	13.23	11.32 1/2	11.96	13.13 1/2	11 93 1/2	11.32 1/2	9.48
Lard per pound	.12 1/16	13 13/16	.11 9/16	.09 1/2	7.07	.06 3/4	.07 23/32
Butter per pound, State Dairy	.37 1/2	.29 1/2	.29 1/2	.22	.22 1/4	.18 1/2	.26 11/16

The prices given are during the suspension of specie payments, currency prices.

E. H. WALKER,
Statistician of the New York Produce Exchange.

NEW YORK, Feb. 26, 1881.

MEDIUM WASHED CLOTHING WOOL.

Average of January, April, July and October Prices.

1863	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880
43	46¼	55	70½	55½	54¼	51¾	44	42¾	40¼	37½	52½

MAUGER & AVERY'S REPORT.

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COST *of* 20 *barrels of Flour*, 10 *Beef*, 10 *Pork*, 100 *bushels Wheat*, 100 *Corn*, 100 *Oats*, 100 *pounds Butter*, 100 *Lard, and* 109 *Fleece Wool, in New York City, at the average of each year, compiled by Months, in Currency and Gold; compared graphically with the decrease in the charge per Ton per Mile on the New York Central & Hudson River Railroad, during the same period.*

GRAPHICALLY REPRESENTED.

YEAR.	COST IN CURRENCY.	COST IN GOLD.	DECREASE IN THE CHARGE PER TON PER MILE, N. Y. C. & H. R. R.R. IN CURRENCY.	DECREASE IN THE CHARGE PER TON PER MILE, N. Y. C. & H. R. R. IN GOLD.
1869	$845.58	$632.68	2.38 cts.	1.78 cts.
1870	891.89	776.02	1.88 "	1.64 "
1871	821.60	735.33	2.49 "	2.11 "
1872	760.24	675.92	1.59 "	1.41 "
1873	755.68	662.50	1.57 "	1.38 "
1874	831.98	748.54	1.46 "	1.31 "
1875	800.28	696.40	1.27 "	1.11 "
1876	727.49	651.74	1.05 "	.94 "
1877	780.29	751.95	1.02 "	.97 "
1878	575.41	569.81	.93 "	.92 "
1979	568.34	568.34	·79 "	.79 "
1880	631.32	631.32		

The above quantities of produce weigh within a fraction of 18 tons of 2,000 lbs. each.

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The New York Central & Hudson River Railroad being the principal target at which all charges of alleged monopoly have been aimed, and it also being in possession of the most level grade between Chicago and the seaboard, let us now make a comparison based upon its charges in 1869 and 1879 respectively, but we will apply their rate to the whole distance from Chicago to Boston, a distance substantially of 1,000 miles.

It will be observed that the through line constituting this thousand miles consists of the Lake Shore, New York Central, and Boston & Albany Railroads. The actual charge on the Lake Shore was lower than on the Central; but on the Boston & Albany it was higher, because the grades are heavier. The New York Central rate is a fair average of the three parts of this line.

Assuming the through rate at the average charge on the New York Central & Hudson River Railroad the cost of moving 18 tons of merchandise from Chicago to Boston, 1,000 miles, would have been—

In the year 1869,	$309.40
In the year 1879,	$102.70

Assuming grain and meat at three-fifths the average rate on all merchandise, which is a fair approximation, the rates would have been—

In the year 1869,	$185.84
In the year 1879,	$61.62

In the year 1880 we exported 8,400,000 tons of grain and a little over 1,000,000 tons of meat and dairy products. Deducting the grain of California and Oregon, the flour of Virginia exported to Brazil, and the dairy product of the East, there remained not less than 8,000,000 tons of grain and meat gathered from the prairies of Dakota, Minnesota, Wisconsin, Nebraska, Kansas, Colorado, Texas, Illinois and Indiana. This produce centred chiefly in Chicago, and the average haul to the seaboard must have exceeded 1,300 miles—as the distance from Chicago to New York is 950, to Boston 1,000 miles.

The reduction in the railway charge, computed in gold, that has been made since the panic of 1873—that is to say, since January 1, 1874—as compared to the average charge from January 1, 1866, to January 1, 1874, has been more than half a cent a ton a mile; as compared to the four years January 1, 1866, to January 1, 1870, inclusive, the reduction in gold has been fully one cent a ton a mile.

Half a cent a ton per mile on 8,000,000 tons moved 1,300 miles measures a saving of

$52,000,000.

One cent a ton per mile on 8,000,000 tons moved 1,300 miles measures a saving of

$104,000,000.

The declared value of the grain, meat and dairy products exported in 1880 for the calendar year was $389,000,000.

The saving in railway service at half a cent a ton constituted $13\frac{36}{100}$ of the total value; at one cent a ton per mile it constituted $26\frac{72}{100}$ per cent. of the total value.

In considering these changes, it must be constantly borne in mind that they have been made chiefly by the strongest and most profitable lines of railroad in the United States—the New York Central, Lake Shore, Michigan Southern and Central, Pennsylvania, Baltimore and Ohio, Illinois Central, Chicago, Burlington and Quincy, and others of similar kind.

It may also be remembered that a considerable part of the reduction in cost has been made possible by the substitution of steel for iron rails, notwithstanding the fact

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that this substitution began when steel rails cost about three times as much as they now do; was continued for a long period at twice the present cost; and the cost of steel rails in this country, or rather we should say the price of steel rails to such railroad corporations as do not make them in furnaces in which they are themselves interested, is now *one hundred per cent. higher* in this country than it is in Great Britain.

It may therefore be inferred that although there may be some temporary upward variations in the charge for railway service, for instance, in Winters when the roads are much obstructed by snow or are injured by freshets, the general tendency will be to steady reduction. This reduction may hereafter be small and slow on the consolidated lines east of Chicago, but must be rapid and large on many of the Western lines.

On Southern and South-Western traffic, a reduction of at least one-half is sure to be compassed within the next decade. These future reductions will be promoted not only by the lower cost of operating, but also of building and extending railroads.

The double cost of steel rails in this country as compared to Great Britain may be considered in connection with the statement of the probable surplus revenue of the United States that may be applied to the reduction of national taxes, if the Congress now elected shall turn its attention from the dead issues of the past to the great fiscal questions of the future that are now pressing for consideration. (See page 221.)

The total weight of our grain crops in the year 1880 was seventy million tons (70,000,000 tons). How much have the people of the United States been saved by the service of the railroads in the cost of moving their own supply of food?

If we begin our computation in the year 1866, being the year after the war ended and the reduction of debt began, and estimate the sum saved in each year on all the merchandise moved by railroads in the United States, the saving will presently be proved to amount to a sum more than equal to the sum that has been paid upon the National debt. In other words, if we were to apply the rate paid for the movement of merchandise from 1866 to 1869, inclusive, reduced to gold, to the quantites moved in each year from 1866 to 1880, inclusive, and then deducted the amount that has been actually paid from the aggregate of that estimate, the difference amounts to more than eleven hundred million dollars ($1,100,000,000), how much more than this sum wil presently appear; the facts are too startling to be stated fully, without proofs preceding them that will prevent their being doubted by the most incredulous.

The details of the traffic of other railroads are not yet available to prove this estimate, but soon will be when Poor's Manual of 1881 is published; but that the rule of increase of traffic and decrease of charge has been constant upon the lines centering in Chicago, as well upon those connecting Chicago with the sea, will be proved by the fact that, comparing the year 1868 on the Pittsburgh, Fort Wayne and Chicago, 1869 on the Illinois Central, Chicago, Milwaukee and St. Paul, and Chicago, Burlington and Quincy, and 1870 on the Chicago and Northwestern, the tons moved increased from 7,708,106 to 17,515,891 in 1879, and the average charge per ton per mile decreased 47 per cent.

One proposition will now be absolutely sustained, to wit: That the excess of cotton which has marked the increased efficiency of free labor, added to whatever sum has been saved in the increased efficiency of the railroads, far more than equals the reduction of debt since the war ended.

It therefore follows that no man in all this broad land has been obliged to work harder in order that the debt might be paid, but the reduction has been compassed by free labor and free railroads.

The price of cotton has declined, but the value of each year's crop has increased; and while the gold value of Western farm products has hardly altered, the crops have doubled.

It cannot be too often repeated that the railway and the steamship have eliminated

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distance. The Western farm and the Eastern workshop, the Southern plantation and the Northern factory have been brought near each other, and in the process the very lines of railroad that have been most profitable to their owners are the specific lines that have performed the largest service at the least cost to those who use them. One day's wages of a common mechanic in Massachusetts will pay the cost of moving his year's substance of bread and meat one thousand miles, from Chicago to Boston.

When we consider this, we may realize that Cornelius Vanderbilt and his associates who led the way in the consolidation of the railway service, and thus rendered low costs possible, were the great communists of the day. They brought about community of subsistence and carried abundance to the door of the common laborer. For every cent they earned in the railway traffic and added to their great fortunes, the people have saved a dollar's worth of labor in the work of earning their subsistence by the reduction of the charges that steadily accompanied the increase of the traffic upon the railroads.

It matters little whether their motive was that of pure selfishness or enlightened self-interest, the result is the same. All commerce is an exchange of services, and it may often happen that he who makes the greatest fortune works the greatest benefit to the community, whether he knows it or not; and to this rule the great railroad corporations, even if they have no souls, form no exception. The principal and most profitable among them now do the largest amount of work for the community at the lowest cost of any that are in operation, and there is no other great element in the cost of subsistence of the whole people that has been so much cheapened in the last ten or twenty years, as the cost of railway service.

May we not, therefore, dread the attempt of State Legislatures, and of Congress, to alter these conditions by meddlesome statutes, and to prescribe rules for the conduct of this vast and varied service? If either body were to attempt to regulate the production of the farm by statute, who would be more quick to resent the interference than the farmers themselves? But the farmers derive their titles to their lands from the same source that the railway owner holds the title to its track. They are no more producers than the common carriers are; they move the soil with their machines; they move the seed; they move the crop on their wagons to the mill and to the market. All that the railroad does is to keep the product moving. One is as much under the supervision of law as the other, but if the work of either could be regulated by statute with success, it would be the simple work of the farmer and not the complex work of the railroad.

Again, who would be more ready to resent any attempt to control the rate of wages or earnings by statute than the great body of consumers to whom the railroad carries its beneficent service? Yet this, again, would need but a page where the prescriptions for the earnings or wages of the railway would need a whole code of laws.

Service for service is the rule of all exchange, and it is the competition of product with product in all the great markets that absolutely controls the traffic on every line of rail, and in the long run compels its managers to do the most work for the least charge. The price of wheat in Odessa controls the policy of the N. Y. Central R. R.

On the other hand, the cost of railway service is not alike between any two points in the country; it differs with the grades, with the distance from fuel, with the appliances for loading and unloading the cars, and with the length of the haul.

It may be said that with all the ability that has yet been given to the problem, no rule has yet been devised by which the special cost of any particular service can be ascertained with accuracy, and the only approach to a rule yet known is based on a crude computation of averages; and it has been well said that the railway service requires a legislature of experts in constant session to save it from ruin.

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In his Railroad Manual of 1880, Mr. Henry V. Poor contrasts the average charge per ton per mile on several of the great through routes between the East and West, constituting the very lines against which the charge of monopoly is most frequently raised.

He gives the tons moved on thirteen principle lines and the receipts from freight. While the traffic increased 47¼ per cent., the earnings increased only 3 84–100 per cent. The average rate per ton per mile in 1873, on all merchandise, was 1.77 cents; in 1879 only 1.02 cents.

He then goes on to say:

"The freight earnings given in the above table were in 1873 about one-third of those of all the railroads in the United States, and in 1879 about one-fourth. Had the rates of 1873 been maintained in 1879, the receipts for the latter year, instead of being $116,311,452, would have reached on the roads named the sum of $230,618,838, and for the United States, $922,475,852. The difference between the amount actually received and that given above shows what has been gained by the public in the operations of our railroads alone. In no other branch of commerce can anything like this saving be shown. It is the result of intelligence, skill and ingenuity, left free to work out the best possible results, unhampered by other legislation than that of their own officers composing a legislature in constant session."

This reduction in the cost of, and in the charge for the service of railroads, is more than equal to the reduction of the public debt in the same period, from 1873 to 1879, yet the more it has been accomplished the louder has been the clamor for legislative interference and the greater has been the misrepresentation of the true facts. Landowners whose possessions would have remained a wilderness, farmers who could have found no market for their produce, miners who could not have smelted their ores, unite in their endeavor to cripple and retard the progress of those who have conferred the greatest benefit upon them, and in this attempt are aided by counsel whose statements of facts and estimates in figures have as little basis in reality as the policy they sustain has in sound reason.*

It cannot be denied that this vast change in the railway traffic has been accompanied with some hardships. There have been periods when a railroad war has occurred and the charge between far distant points has been reduced to less than cost. At such times the charge between intermediate points, not being reduced in the same proportion, has seemed unduly high, and many places have suffered from what appeared to be an unjust discrimination; but the real fault may have been that the rate on the long traffic has been too low and not that the rate on the short traffic has been too high.

Again, the terminal charges constitute a much greater part of the cost than any one who has not carefully examined the subject would believe; they therefore constitute a very large element in the cost of a short haul on small quantities, and may be a very small element in a long haul of very large quantities.

Again, it is impossible that such a service should have been organized in so short a time without inequalities for which time only could disclose a cure.

When we think of this vast service in the concrete the mind almost refuses to receive the impression, and the magnitude of the transactions and of the quantities moved renders the comprehension of the simple elements of the problem exceedingly difficult. The subject must be presented in its two-fold aspect—in terms of least and greatest. The daily ration of solid food of an adult consists of about two and a half

* See the exposure by Albert Fink of the mis-statements made by Judge J. S. Black (*N. Y. World*, Feb. 25, 1881, and in later numbers of the same paper).

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to three pounds of meat, bread, vegetables, sugar, butter, etc.—let us call it three pounds, or one pound each for breakfast, dinner and supper.

The great crops of grain now produced in this country weigh seventy million tons; the hay crop, which is but a synonym for meat, butter and cheese, adds thirty million more; to these must be added the root crops,—the weight of sugar, tea, coffee and other articles of food; in all, not less than one hundred and fifty million tons of food must be consumed by this nation or exchanged for the foreign products that we need. This huge volume is but one year's supply, to be moved not only once, but twice, thrice, and more; it must all be converted and reconverted, sorted, divided and exchanged. Three hundred thousand million food pounds to be converted, condensed, and finally sorted into as many parcels of three pounds each as there are people, in order that each may have a breakfast, a dinner and a supper.

How is this movement compassed? By cart and wagon; by railroad, lake or canal; again by wagon or by hand; if the movement be analyzed the most costly part is the last or final distribution. If the wheat be traced throughout its course the heaviest single charge upon it will be found to be the cost of distributing the loaves of bread that come from the baker's oven; the lightest, the charge for moving the barrel of flour a thousand miles from Chicago to the seaboard.

Ten barrels of flour constitute a ton weight—the railways earn a dividend when moving this quantity a thousand miles at five to seven dollars a ton, or half a cent to seven-tenths of a cent a ton a mile,—1,000 miles at only fifty cents a barrel! What does it cost to move the barrel from the railway to the warehouse—from the warehouse to the baker's oven? How far will half a dollar or seventy cents go in paying the cost of moving and distributing the 100 to 300 loaves of bread that are usually made from that barrel?

Any attempt to control the rates that may be charged upon a railroad by statute is but an indirect attempt to regulate prices by law. Such undertakings have always failed. If legislators desire to test their ability, let them undertake to regulate the traffic in loaves of bread, and see how much they can cheapen the cost of running bakers' carts and carrying on grocers' shops. Every sumptuary law has failed; scarcity has ensued from every attempt to regulate prices by law in all lands and at all times; and even where statutes regulating the price of railway traffic have been enacted in this country, they have either been disregarded or repealed as soon as the attempt to enforce them has proved their mischievous effect.

The traffic over the New York Central and Hudson River Railroad, mostly from Buffalo to New York, amounted in 1880 to over ten million tons, one-half or two-thirds of which was food. For this part of the distance between New York and Chicago, the proportion of each half dollar on each barrel of flour was not over thirty to thirty-five cents. If a forced reduction of this charge could be made by law to the extent of one-half, consumers and producers might gain fifteen to twenty cents a barrel, but the end might be bankruptcy even to that great corporation. Fifteen to twenty cents is little if any more than the average cost of moving that barrel from the warehouse of the dealer to the dwellings of his customers. On such small fractions does the great railway service now depend.

There is another aspect of least and greatest. Nearly 60,000,000 tons of coal are mined and moved every year, and a large amount of this coal is consumed in the railway locomotives that again are worked in moving other substances. The present locomotive engine is almost barbarous in its waste of fuel; not over three or four per cent. of the actual units of heat in this fuel are converted into the actual motion of the train, and the dead weight of the train and engine is three or four to one of the load carried. Not over one pound in a hundred of coal consumed on a railroad is actually and absolutely applied to the movement of the load. Yet this power has caused

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a social revolution in this country, and is rendering the payment of rent on land devoted to agriculture in Great Britain almost if not quite impossible, because it has enabled us to sell grain, meat and dairy products at such low prices that they leave little or no margin for rent on land devoted to their production in any part of the Kingdom of Great Britain and Ireland.

Having thus presented a part of the argument in favor of free railroads, and stated the result, before we consider the final summary let us devote a small space to the beneficent power of free labor, cotton as well as corn constituting one of the great powers of the land.

In the last years that preceded the final struggle by which this nation at last became truly free, the writers in "De Bow's Southern Review" gravely argued that it was the high price and not the low price of cotton that limited its production; because, for every cent a pound added to the price of cotton a hundred dollars was added to the price of the human chattel that raised the crop; hence, whatever the stimulus to the traffic in slaves this might give, the States or sections that engaged in the most abhorrent and barbarous practice of supplying this demand could not adequately meet it. It thus happened from 1858 to 1860, when the spindles of the North and of Europe were rapidly increasing, that for every million dollars expended in a new factory, the Cotton States must have earned and expended a million and a half dollars in stocking with human live stock and starting the new plantation that was to supply the mill with cotton.

That this could not be done was plain to the far-seeing vision of the few leaders in Secession by whose acts the Civil War was promoted, and under whose malignant control white and black alike were kept in the bondage of oppression and of ignorance; hence the ill-concealed, and often openly avowed determination to re-open the slave trade.

It will not be long ere these base purposes will appear to have been as infamous to the progressive men who now constitute the New South as they did to John Brown when he began the great struggle for freedom in his attack upon Harper's Ferry, and the time may not be far distant when the descendants of the soldiers in the Confederate armies will erect a monument to John Brown as the great liberator of their land from oppression.

The inefficiency of the old system will be apparent from the two following tables.

Feeble attempts have sometimes been made to disprove the evidence of these figures; it has been affirmed that the increase of cotton has been due, not so much to the greater efficiency of labor as to the application of white labor to new fields under new conditions. What better testimony could be borne to prove the utter inefficiency of the old system, which compelled the most intelligent masters to work their slaves with the modest tools and most unfit methods, but forbade white men working at all except under a sense of indignity. It is grandly true that emancipation struck the shackles from the wrists of white as well as black—mind and muscle were set free together.

The most conclusive evidence of progress in the Cotton States is to be found in the immense increase in the number of small farms; but still further evidence is to be found in the fact that the consolidation of Southern railroad lines has begun, by which the cost of transportation between North and South will soon be reduced at least one-half.

When this occurs the advantage of the manufacturer of New England over his competitor in Old England, which now varies from half to three-quarters of a cent a pound, may be increased, to our great advantage in the export of cotton fabrics.

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Crops of Cotton of the United States—Fifteen Years of Slave Labor.

Season.	Bales.
1846–7	1,860,479
1847–8	2,424,113
1848–9	2,808,596
1849–0	2,171,706
1850–1	2,415,257
1851–2	3,090,090
1852–3	3,352,882
1853–4	3,055,097
1854–5	2,932,339
1855–6	3,645,345
1856–7	3,056,579
1857–8	3,238,962
1858–9	3,994,481
1859–0	4,823,770
1860–1	3,896,086
	46,675,591

It is doubtless true that a considerable part of the recent crops have been made by white labor; that proves yet more conclusively the redemption of the Cotton States from oppression.

Crops of Cotton of the United States.—Fifteen Years of Free Labor.

Season.	Bales.
1865–6	2,298,987
1866–7	2,059,271
1867–8	2,498,808
1868–9	2,439,039
1869–0	3,154,946
1870–1	4,352,317
1871–2	2,974,351
1872–3	3,930,508
1873–4	4,170,388
1874–5	3,832,991
1875–6	4,669,288
1876–7	4,485,423
1877–8	4,811,000
1878–9	5,073,531
1879–0	5,757,397
	56,438,335

Excess of 15 Free Labor Crops 9,762,741

The crop of cotton of 1880–81 will probably reach 6,250,000 bales.

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It may now be time to show the relation which the excess of our grain and cotton crops have borne to the reduction of our national debt. It is with the excess of farm products of grain and cotton that we have paid our foreign debt and have reduced the gross debt of the nation.

The maximum debt, liquidated and unliquidated, as computed by Hon. Hugh McCulloch in his last report as Secretary of the Treasury:

On the 1st. August, 1865, amounted to	$2,997,386,203
On the 1st March, 1881, it was	1,879,956,412
Decrease in 15 years and 7 months	$1,117,429,791

The excess of cotton raised in this period above the quantity raised in the last 15 years of slavery, 9,762,741 bales, all of which has been exported, has been worth in gold coin over $650,000,000. When this year's crop is added and sixteen years are compared, the excess of free over slave labor will be nearly 14,000,000 bales, worth in gold coin at least $800,000,000.

The great progress of this nation and its relief from the burthen of debt are due two factors—free labor and free railroads. Add to the first fruits of liberty in the Cotton States the sum that has been saved on our grain crop by the reduction of the charge upon our railroads, and the aggregate of the two sums is vastly more than equal to the amount that we have paid upon our national debt in the period that has elapsed since the surrender of the Rebel armies.

Without this reduction in the railway charge the export of grain and meat would have been very limited, and the grain would either have been wasted or it could not have been produced. The relief from the crowded state of the cities that took effect during the war would not have been possible, nor could the disbanded armies have found peace and prosperity on the farms of the Great West.

In the four years after our armies were disbanded, preceding January 1, 1870, to wit, 1866 to 1869 inclusive, the actual tons moved over the New York Central and Hudson River Railroads numbered 10,102,569; the tons moved one mile numbered 1,868,448,779; the freight earnings were $50,556,875 in currency, or, reducing each year's earnings to gold at the average rate of each year, $36,560,000 in gold.

The average charge per ton per mile for this period was, therefore,

In currency	2.7058 cents.
In gold	1.9567 "

In the ten years ensuing, 1870 to 1879 inclusive, the actual tons moved on the same line numbered 60,221,558; the tons moved one mile numbered 14,358,521,585; the freight earnings in currency were $174,594,548; reduced to gold, $159,658,000.

The average charge per ton per mile in this period was, therefore,

In currency	1.2164 cents.
In gold	1.1123 "

The reduction in currency has therefore been 1.4894 cents per ton per mile, in gold .8444 cents in the latter period as compared to the former. Applying these rates of reduction to the tons moved one mile in the ten years, 1870 to 1879, inclusive, to wit, 14,358,521,585, we get the following results:

Reduction in currency	$213,781,350
Reduction in gold	$121,201,136

That is to say, had this line been able to charge the same rate in gold from January 1, 1870, to January 1, 1880, that it did charge from January 1, 1866, to January 1, 1870, its earnings from freight would have been $121,201,136, or 70 per cent. more than the actual charge made and collected.

Does any one suppose that this reduction was made from choice? Would not the managers of this line have charged the same rate in each period if they could? This change has been accomplished under the pressure of three separate factors:

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First.—The competition of railroad with railroad, working in moderate degree.

Second.—The competition of all the railroads with all the water-ways of the country, working constantly, and each year more and more effectively.

Third.—The competition of product with product, in all the great markets of the world—the most potent factor of all the three.

Had not this reduction in the charge for moving our crops been made upon this line, coupled with an equivalent reduction on all the lines between Chicago and the seaboard; had there not been a reduction in substantially the same degree on all the great Western lines centering in Chicago, the crops could not have been moved at all; they could not even have been made, because the export of the surplus not required for home consumption would have been forbidden.

Had not the production of these great crops been promoted and made possible by their further production or leading forth upon the railroad to the use of men, our disbanded armies could not have found homes and work without long delay, but they would have been crowded back upon the cities and towns already occupied by the excess of population that the abnormal demands of war had centered in them.

There is but one more example that needs to be given. In the single year 1879 the

tons moved one mile on the N. Y. C. and H. R. R.R. numbered	2,295,827,887
Freight earnings	$18,270,250
In the four years 1866 to 1869 inclusive, the tons moved one mile numbered	1,868,448,779
Freight earnings in currency	$50,556,875
" in gold	$36,560,000
Gold charge per ton per mile in 1866 to 1869 inclusive	1.9567 cents.
" " " in 1879	.7954 "
Reduction	1.1613

Had the charge of the first period been made upon the traffic of 1879 the difference would have been $26,650,000 more than the actual amount collected.

The following table gives in a graphial form the facts that mark the changes that have occurred on the New York Central and Hudson River Railroad, comparing the average of each year, 1866 to 1869 inclusive, with the single year 1879:

EACH YEAR'S AVERAGE FROM 1866 TO 1869, INCLUSIVE, COMPARED TO 1879.

NEW YORK CENTRAL & HUDSON RIVER R.R.

INCREASE.	PER CENT.
Actual tons moved	374
Tons moved one mile	491
Earnings in gold	200
DECREASE.	
Charge per ton per mile in gold	59.35

Actual charge on 9,441,213 tons moved in 1879 ..... $18,270,550

Charge as it would have been had the average gold rate of 1866 to 1869 inclusive, been made in 1879 ..... $44,920,250

Difference saved on the traffic of 1879 ..... $26,650,000

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In the consideration of this table two facts should be observed:

First.—That the increase in the tons per mile moved exceeds the increase of the actual tons moved 117 per cent., from which fact it would appear that the local or State traffic has gained in more than a full proportion from the reduction in the charge per ton per mile.

Second.—The prices of the leading products of agriculture named in a preceding table, at the port of New York, were substantially the same in 1879 as they were if computed in gold in 1869, from which it may be assumed that Western producers have received the full benefit of the reduction upon the through traffic.

All the data for the above computations have been taken from "Poor's Railroad Manuals" without any knowledge on the part of any person connected with any railroad line of the writer's intention to prepare this statement; some of the tables have been submitted to railroad officials for examination, but the writer has no connection with and hardly any interest in any railroad; his sole purpose in the preparation of this paper has been to clear away the rubbish that obscures a most important public question.

The traffic upon the New York Central & Hudson River Railroad in 1880 amounted to over ten million (10,000,000) tons. Mr. H. V. Poor estimates the traffic on all the railroads of the United States in the same year, including coal, at two hundred and fifty million tons (250,000,000).

The traffic on this line has not increased in any greater degree than it has upon many other main lines to Chicago, or from Chicago to the sea, although it may have increased more than that of other lines in other directions. The reduction on the freight charge has been equalled, or even exceeded, on some other important lines, but is probably greater than the average on all the lines of the country taken together.

The saving on this line only, in the ten years from 1870 to 1879 inclusive, was over *one hundred and twenty million dollars* in gold coin ($120,000.000).

If the traffic on this line represents a twentieth part of the traffic of all the railroads of the United States, and the charge has been decreased in the same ratio, it proves a saving of twenty-four hundred million dollars ($2,400,000,000) in ten years time.

But there is another more certain method of establishing the ratio of the traffic of this line to all the rest. In the Railroad Manual for 1880 the freight earning, of all the roads of the United States are given for nine years, 1871 to 1879 inclusive, amounting to $3,228,808,877.

The freight receipts of the New York Central & Hudson River Railroad during the same nine years were $160,105,322, or substantially one-twentieth of the whole amount.

But this ratio may be contested, and neither time nor space suffice for the necessary proof. It may be alleged that the reduction of charge on this line has exceeded the average.

Let it suffice to prove what cannot be gainsaid, and what will presently be more than proved when the compilation of the traffic of all the great through lines is completed, on which Mr. H. V. Poor is now engaged for his Manual of 1881.

If the reduction on all lines has only been one-half that upon this line; if one-half remains yet to be gained, still the aggregate saved has been twelve hundred million dollars ($1,200,000,000), or a larger amount in ten years than the aggregate reduction of the national debt in more than fifteen years.

If this be admitted, then the point is well taken that no man has worked harder or longer in order to make this payment; but it has been the result of only a partial solution of one of the problems of distribution.

The function of statute laws in this matter has been, that so far as general laws have rendered the co-operation of labor and capital possible, by means of the organiza-

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tion of corporations competent to do the work, they have been necessary; and it is for that work, in part, that governments exist and that statutes are needed.

So far as attempts have been made to impose special conditions, and by statutes to regulate rates of traffic and to control the executive work of the railway service, they have either obstructed progress or failed to meet the intention of those who framed them; or else they have become inoperative within a very short time after their enactment.

The forces that rule this country, North and South alike, are the great industrial powers born of agriculture, and promoted by commerce among men and nations. These forces are reconstructing Southern society, and forcing even the most unrepentant Bourbon to obey their behest; while the ship-loads of corn with which we have attacked the privileges of those classes in England, who would have destroyed this nation, have been more potent than any weapons of war that were ever forged.

The writer has treated this subject in another place, but is permitted to present it again, in order to show yet more conclusively the power of the farmer and the railroad when united in the bonds of a common interest. In so doing he must indulge in some repetition. He has no apology to offer for this or any other repetition in presenting this case. It must be considered in every aspect in order to be comprehended.

American competition in grain, meat and dairy products is making it almost impossible that rent shall continue to be paid on land devoted to agriculture in Great Britain.

From recent investigation it appears that out of 72,117,766 acres comprising the total acreage of Great Britain, exclusive of the metropolis, 15,303,165 acres, or a little more than one-fifth, are divided into 1,593 separate landed estates, and are held by 525 dukes, marquises, earls, viscounts, and barons, constituting the House of Peers. These estates have yielded an annual rent of £12,529,068, over $60,000,000. Even this statement, startling as it appears, is believed by Mr. Arthur Arnold to be an underestimate both of the acreage and of the rental, as the estates of peeresses were not included in this compilation, neither were many estates held in special trusts.

In the further treatment of the question of land-tenure, Mr. Arnold reaches the conclusion that more than four-fifths of the land of Great Britain is in the possession of about 7,000 persons; but in regard to their title he makes a distinction between *possession* and *ownership*, in view of the fact that at least 52,000,000 acres of this land are held by those who are only life-tenants under entails or other settlements. Mr. Arnold's words are, "I say, *in possession*, because the landed gentry in this country are not *owners*, in the strict and proper sense of the word, of the lands with which their names and titles are connected."

He contests the view commonly held in this country, that the price of land is very high in England, and that the high price is induced by the social distinction that its possession implies; but holds, on the contrary, that the price of land is far below its true value, and that it pays but a low rate of interest, for the reason that its use and product are restricted by the necessary conditions that must be imposed upon the tenant, in order that the system of landlord and tenant may be sustained at all; that, if it could be freely used in the cultivation of a variety of products, the income would be much greater and the price would then advance.

It is difficult for any one in this country to imagine such a condition as is pictured by these figures; four-fifths of the area of a country inhabited by about 33,000,000 people, owned by 7,000 persons, and four-fifths of that portion held only under a life-estate!

Such is the system now approaching its end under the effect of our competition. The longer legislative abuses or obstructions are maintained, the more severe must be the struggle for their removal; yet when the time comes they must yield, because

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the further attempt to maintain them means war or anarchy. Witness the condition of Ireland at this very time.

Let the bitter struggle through which England passed in the great contest over the corn-laws be remembered; let it be considered that the power of the House of Lords and of the Established Church is founded mainly on the possession of and the rent of land; further, that the very existence of the present system depends absolutely upon a body of trained tenant farmers, estimated at about 560,000 in number, in Great Britain, (there are over 600,000 tenants in Ireland) whose capital has been invested in improvement of these lands; which capital has been, or is now being, destroyed by a series of bad seasons and by our competition; that without these tenant-farmers the possessors of the soil are as powerless to use land as they now are to dispose of it; and then the true meaning of wheat at forty shillings a quarter, and beef at sixpence a pound, will be apparent, if it be true that these prices will continue to be profitable to us, and yet forbid any rent being paid upon land devoted to their production in England.*

It may be as true of the economic as of the spiritual gospel, that it brings not peace, but a sword. It cuts away abuses, that in their fall will promote much misery before the righteous conclusion is attained. No return to the protection of agriculture in Great Britain can be considered for a moment: the rent of land is but a tithe of the income of the people, and cheap food is vital to the very existence of the vast majority who are engaged in manufactures, in commerce, and in the mechanic arts. It may well befit us who are spared the distress which must ensue before this revolution on which Great Britain is now entering is ended, to remember that we are members one of another, bound by the inter-dependence of nations, and that upon the welfare of England our prosperity greatly depends, because she is our principal customer. As the fall of slavery brought misery on both North and South here, so must the fall of privilege work sadness over the sea.

It is this system, with all its good and evil, that is now tottering to its fall. The pleasant country life, of which Washington Irving gave us such charming pictures, and of which we have read so much in English literature, may have to give place, in order that pauperism may be abated. The abounding charity of those who enjoyed its benefits could only alleviate this evil; almost a revolution is needed to remove its cause. Rented land must of necessity be cultivated under conditions that will maintain its fertility, whether held under lease or only at will. These conditions can only be applied in any large measure to staple crops or to grazing and dairy farming; they are inconsistent with small farming, unless the landlord himself owns but a small area of land, and gives close personal supervision to the manner of its cultivation by his tenants. Great estates can only be rented on the conditions that are applicable to the great staple crops of grain, or to the products of the dairy and of meat.

The competition in the sale of wheat in Great Britain, on the part of this country, has already caused a reduction in the area of land devoted to wheat, from a little under 4,000,000 acres to a little over 3,000,000, during the last seven years—a reduction of one-fourth. A portion or the whole of this discarded area has been devoted to grazing, but during the latter part of this period our competition in meat, butter and cheese, has effected the rent of land used even for these purposes. The English Commissioners, Messrs. Pell and Reed, who lately visited this country, concluded that there was more permanent danger of our competition in the production of meat than of the permanent continuance of our export of wheat.

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*Seventy per cent. of the tenant-farmers of England occupy less than 50 acres each; 12 per cent. between 50 and 100; 18 per cent. over 100. Five thousand occupy between 500 and 1,000 acres each; 600 occupy over 1,000 acres each.—JAS. CAIRD, *The Landed Interest.*

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They seem to have come to the conclusion that our railway service had reached its lowest cost, and could not be much more reduced; and that as the virgin soil of the far West became exhausted, we should be unable to export wheat at less than forty-eight shillings a quarter, although they admit that the day is still far distant when this upward limit will be reached.

In the meantime rents are not only being greatly reduced in England, but many of the heavy lands as yet undrained are thrown entirely out of cultivation—the encumbered owners being unable to drain or improve them, and no tenant being willing or able to work them. The Irish land question is but the beginning; the English land question must come next, and cannot long be deferred. It may happen that no delay in the change of the system of land tenure in Great Britain need be made in the expectation that there will not be a continuance of our supply of wheat, and that as our product increases in ratio to our home demand we may not supply wheat in Liverpool even at thirty shillings a quarter, if we can get no more.

For instance, the Blue Limestone, commonly known as the "Blue Grass" section of Kentucky, covers 10,000 square miles or 6,400,000 acres—more than double the present wheat acreage of Great Britain. It appears to have been overlooked by the Commissioners, but with a tolerable system of farming it is capable of producing as large a crop of wheat per acre, *without manure*, as the average of the high farming of England—the rotten limestone containing a very large proportion of phosphates sending up new elements of fertility every year, so that the cost of production is only the cost of cultivation and of harvesting the crop. This section has had only an indirect connection with the seaboard, but will presently have one or more direct lines of communication averaging about 650 miles.

The only reason that a full supply of wheat may not then be profitably sent to England at thirty shillings a quarter will be that hemp, tobacco, horses, mules and cattle will pay better. There are several other sections of the New South from which nearly or quite as good results may be expected, of which even we at the North as yet know but little.

Lest it seem rash to make positive assertions, let us consider some questions in regard to a small section of the New South, that may even make it necessary for some of our own countrymen to study geography again.

Cannot a square of land, about three-fourths as large as France, be marked off in the centre of that portion of the United States, lying east of the Mississippi and south of the Ohio, comprising a portion only of the States of Kentucky, Tennessee, Alabama, Georgia, North and South Carolina, and Virginia, covering the "Blue Grass," the "Piedmont District," the ranges of the Southern Alleghenies and the Blue Ridge, with the rich upland valleys lying between; all of which section will range from 650 to 6,700 feet above the sea, and be quite free from malaria, unless it be in some of the river bottoms? Is not this section, which is nearly twice the area of Great Britain, equal to Great Britain and France combined, in the variety and quantity of its possible mineral products, and more than equal to either in its possible agricultural products?

It contains the purest iron and coal in close proximity; salt, sulphur, copper, lead, zinc, corundum in greatest abundance, and also gold, which could well be spared if tin might take its place.

In fact it may well be asked could not this single section of the New South sustain the present agricultural and mining population of the United States in health and comfort, and under much better average climatic conditions than they now enjoy?

Is not this *terra* (almost) *incognita* of this country, yet inhabited as to about one-half its area, only by a very sparse population, so isolated by the surrounding pall of slavery until recent years, as to have depended wholly upon themselves? Are there not even yet numbers of inhabitants in these fertile mountains and valleys clad in

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homespun, some of whom have never even seen a wheeled vehicle,* and greater numbers who have never seen a locomotive engine.

Is not a national survey of this territory called for, in order that the facts as yet observed only by a few may be spread upon the national record so as to turn the tide of emigration, especially of the English, toward a land which may be vastly more congenial to them than the distant prairies of the far West?

Well may the laborers of Europe, borne down by the burthen of debts that can never be paid, and that have been mainly incurred in sustaining the vested wrongs that oppress them, have watched the struggle for personal liberty in this land as one in which they also had the greatest stake. The great crops that have been treated in this paper, are but the first fruits of that personal liberty—the shadow only of the substance yet to come.

The population of Europe, aside from Russia and Turkey, numbers about 225,000,000. They occupy an area equal to the arable land only of this country, or a little over 1,500,000 square miles. Upon the continent of Europe more than one in every hundred and ten ofthe population is a soldier in active service. This means that the work of one adult man in every twenty-two is withdrawn from productive service, and he must be sustained at a heavy cost by those who remain at work; of whom again one and most countries two more are forced to waste a large part of their time in the reserve, and are subject to be called into active war at a moment's notice.

What may be the changes that the adverse conditions of Europe and the prosperity of this country may bring into action, few can yet conceive. Of this we may be sure—that the coming century of liberty and commerce will only serve to make the past century of slavery and war more dark than it ever seemed before, as the North and the New South united, emerge from the shadow not yet quite dispelled, into the glorious sunlight now flashing in the dawn.

In this again, the figures fail to convey the impression, and the graphical method must be adopted. In order to convey the impression, let us omit from the consideration the half civilized nations of Russia and Turkey in Europe, and omit Alaska in the United States.

Austria, Germany, Roumania, Servia, Montenegro, Italy, France, Spain, Portugal, Netherlands, Belgium, Greece, Switzerland, Great Britain, Denmark, Sweden and Norway comprise 1,546,802 square miles.

The United States, aside from Alaska comprise 3,034,399 square miles.

The national debts of the Empires and Kingdoms of Europe in the above list, according to the latest data as given in "Mulhall's Progress of the World," amounted to $16,794,800,000.

The debt of the United States on the 1st March, 1880, was $1,880,000,000.

The national expenditures of the above named States of Europe in 1879, amounted to $2,282,800,000.

The national expenditures of the United States in the fiscal year ending June 30, 1880, amounted to $267,642,957.

The population of the States of Europe named, according to the latest census taken at different dates since 1875, approximates 225,000,000.

The population of the United States, June 1, 1880, was a trifle over 50,000,000.

The standing armies of the States of Europe named, in actual service in camp or barracks, together with smaller but more expensive force in the navies of the maritime states number over 2,100,000 men, to whom must be added a much greater number in the reserves who have wasted years of their lives in preparing for war, and who may be called into active service at a moment's notice.

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* Such is the testimony of recent scientific explorers.

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The standing army of the United States numbers 25,000 men.

The following table will convey a much more vivid impression of the relative burthens than these figures can give :

THE BURTHENS UPON EUROPE AND AMERICA COMPARED (OMITTING RUSSIA, TURKEY AND ALASKA).

RELATIVE AREAS.

Europe, 1,546,802 sq. miles	
United States, 3,084,399 "	

RELATIVE POPULATION TO ONE SQUARE MILE.

Europe, 145 per sq. mile	
United States, 16½ "	

RELATIVE BURTHEN OF DEBTS TO EACH INHABITANT.

Since 1848 the debt of Europe has nearly trebled and is still increasing. In 1880 it was $16,794,800,000, or an average to each inhabitant of $74.64	
In 1848 the United States owed no debt of any moment. On the 1st August, 1866, our war debt was at its maximum, and was estimated (liquidated and unliquidated) by Secretary McCulloch at $2,997,386,203—an average to each inhabitant at that date of $83.35	
March 1, 1881, the debt had been more than one-third paid, and was reduced to $1,879,956,412—an average to each person of $36.85	

RELATIVE BURTHEN OF NATIONAL EXPENDITURES TO EACH INHABITANT.

Europe in 1880, $2,282,800,000—or an average to every person of $10.15	
In the United States, in 1866, after our armies were disbanded, our expenditures were $346,729,130—or an average of $9.63 to each inhabitant	
In the fiscal year ending June 30, 1880, they were $267,642,957—or an average of $5.35.	

RELATIVE BURTHEN OF STANDING ARMIES.

In Europe each 110 inhabitants, or at the ratio of one able-bodied man to each five, each 22 men sustain one soldier in active service. The reserves, liable to be called into active war at any moment, are estimated at twice the regular armies	
In the United States each 2,000 inhabitants, or each 400 men, sustain 1 soldier	

If these lines do not convey an impression of duties as well as privileges to the citizens of this country, they will fail of their purpose.

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While our Senators are debating questions of appointment to petty offices connected with that body, the great industrial forces of the Nation are seeking true statesmen who shall give them opportunity to work with freedom.

It was well said by Carl Schurz on a recent occasion, "that it proved the strength of this Nation that the most important question on which the last Congress divided, was the question whether the rate of interest that the Secretary of the Treasury might be permitted to offer on refunding the National Debt, should be three or three and one-half per cent."

It is a sign both of the strength and of the weakness of the Nation that in the present session of the Senate of the United States, the most important question at issue appears to be, what person shall occupy the position of Sergeant-at-Arms of that body, and dispense the patronage of that petty office.

The war is ended and slavery is dead; the new forces born of liberty are reconstructing the late Slave States with a power that no act of Congress can much affect. The wise policy of the late Administration has given these forces almost free play, and their results have been made evident in the welfare of white and black alike, such as has never been witnessed in the past, however short it may be of that which will surely be attained in the future.

The interest of the people demands general laws that shall give equal opportunity to all; Congresses and Legislatures spend year after year in special legislation, hence the greatest confidence exists, and therefore the greatest progress is made, when neither are in session. If they would spend their time in removing the obstructive statutes that their predecessors have enacted, their sessions would be welcome.

In the last century the inventions that have been applied to textile manufacturing have reduced the work of furnishing all the cotton cloth that 1,000 inhabitants of this country, 1,600 Chinese or 3,200 East Indians need in a year—to the measure of the labor of two hands in the cotton field, one man's work or its equivalent in money to move the cotton to the factory and two operatives tending the spindles and looms—only five in all. A less proportion of each thousand can furnish all the woolen fabrics needed.

In twenty years the improvements in the handling of timber have reduced the labor of conversion into boards and other building material so much that one man is sure to take the place of eight then employed.

Who can measure the potentiality of machinery applied to agriculture? The week's ration of a Southern negro, which he chooses in preference to any other food, is a peck of meal and three-and-a-half pounds of bacon, worth at wholesale prices 35 to 50 cents. One man working a pair of horses in Iowa can work sixty acres of land, each acre producing sixty bushels of corn at sixty pounds to the bushel, or 216,000 pounds—108 tons.

In every art the labor and drudgery have been reduced and the product increased, while science has, at the same time, abated most of this noxious and dangerous condition of work.

The problems of the future are not how to produce but how to distribute the abundance of the field, the mine and the factory. Abundance and intelligence go hand in hand, and the measure in which this assured abundance may be enjoyed is but the measure of the service that each section, each State, or each person, of our common country can render to his neighbor.

With each improvement in machinery, wages or earnings become larger, and the hours of labor necessary to subsistence are diminished; the absolute share of the capitalist is increased, while his relative share of each year's product is diminished; on the other hand, the share of the laborer is increased both absolutely and relatively. The common allegation that the use of machinery decreases employment and reduces wages is without foundation. The "progressive desires" that distinguish men from

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beasts bring new wants into existence, and as the possibility for better conditions of life ensues the standard rises in respect to what is necessary to a comfortable subsistence.

Imports continually increase as the export of our excess enables us to pay for them, and "the ships that pass between this land and that, are like the shuttle of the loom, weaving the web of concord among the nations."

Since the end of the Rebellion of Slavery against Liberty, the great forces of industry and commerce have assured prosperity in spite of the malignant effects of inconvertible paper money, of the constant attempts of Congress to tamper with the standard of value, and of State Legislatures to hamper and restrict the movements of trade by means of obstructive and meddlesome statutes applied to railroads. But the common sense of the people always finds its exponent, and by the veto messages of President Grant and President Hayes, some of the most obnoxious measures have been stopped, while the Granger Acts applied to railway service defeated themselves as soon as any attempt was made to enforce them.

It only now remains for legislators to learn that their chief duty is to remove obstructions rather than to attempt to impose conditions upon commerce.

It is useless to palter over names that have ceased to represent ideas or facts. This nation has a function in the world that is yet almost a vision. There are three economic principles that it needs first to learn before the vision can be realized.

First. In this country earnings or wages are limited only by want of intelligence, skill, or industry.

Second. The man or woman that earns *the highest wages* in the factory, on the farm or in any department of indusiry in which machinery is largely employed compasses the largest production at the lowest cost.

Third. The State that exchanges the product of its machinery and skill with another in which manual labor is still the rule, gains most in wealth.

Liberty under laws that forbid injustice and oppression, but leave the whole movement of society perfectly free, is the condition under which the greatest material results can be attained. When South and West shall strive alike, with equal skill and equal intelligence, to do the work best adapted to their climate and soil, all sectional antagonism must cease, and all alike shall prosper. In order that this prosperity may be most fully enjoyed, it will be necessary that the two instrumentalities by means of which all exchanges are made possible—the railroads and the banks—shall be relieved from the obstructions that ignorance and prejudice combined seem determined to place in their way.

But one thing more remains to be considered, and that is, the revision of the tariff. On the one side are the advocates of the system of protection, who have themselves petitioned Congress to appoint a Commission of Experts to do the necessary work. On the other side are those who, like the writer, believe that true protection to American industry would consist in the gradual removal of all legal obstructions to commerce, but who yet well know that for many years to come a tariff must be maintained for the purpose of collecting a large revenue from customs. If once this question could be fairly reached and the necessary legislation secured for the appointment of such a commission, a moderate tariff might be enacted that the reasonable men in both these schools would sustain; the country might have a long period of rest from the danger of meddlesome legislation upon this vexed question.

It would be an interesting task, did time and space permit, to add to the computation made in this paper of the sum saved and annually added to the quick capital of this country by the service of the railroads—another computation of the yet larger amount of added capital that now represents the increased efficiency of the annual work of the people of the United States. It would be safe to assume that, where the

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mechanical work of distribution has been reduced one-half in the last ten years by the service of the railroads, the primary work of the production of our fields and of our mines, and the secondary work of manufacturing their crude products into other forms ready for consumption, have been reduced at least one-fourth by the improvements in machinery and metallurgy during the same period.

As a productive unit, every man in the United States possesses fully one-third more power than he did in the year 1866, when personal liberty had been finally established and forever assured in this land.

It is this abundance of quick or active capital, the product of these new forces—of corn and pork, of beef and bread, of iron, of cotton, of copper, wool and the like, and all their secondary products—that is borrowed and lent by the instrumentality of money. It is the title to these commodities, measured in money, that is deposited in banks and that is lent by their officers.

It is this vast increase of actual substance that has reduced the safe rate of interest to only three per cent. now where it used to be six or more.

Whether the rate that shall be paid for the borrowing of this capital shall remain at three per cent. or even less, or be advanced by its quicker and more productive use, is no longer a material question, but one of intelligence and integrity.

The field for its use is as broad as the land itself, of which as yet less than one-sixth part of the arable portion fit for cultivation is under the plow, and even that produces only half the crop that more skillful cultivation would give.

One-half at least of the territory of the United States, aside from Alaska, is believed to be good arable land, exceeding 1,500,000 square miles, while the area cultivated in grain, cotton and root crops in 1879 was less than 225,000 square miles.

Who then shall NOT fully enjoy the use of this new capital?

First.—The States either South or North that repudiate their debts.

Second.—The citizens of these States. Where public integrity is not maintained, private confidence and credit cannot be established.

Third.—The States in which the laws relating to the title of land are not simple and well devised to give security to him who buys.

Fourth.—The States in which the laborer is not honored, and where justice is not accorded to rich and poor alike without distinction of race, color or condition.

Fifth.—The cities in which municipal integrity is not assured. They may be centers of material wealth by the mere power of their position, but they will be in constant danger until public duties are as well performed as the work that is done for private gain.

Sixth.—All persons whose intelligence, education or opportunity has not sufficed to train them in the use of borrowed capital in a way that shall be profitable to them and at the same time safe for the lenders.

This last exception of those who cannot yet fully benefit by the greater power of producing and accumulating capital is the most material one in the list. It seems very certain that the power of accumulating has for the time being outrun the power of using, hence capital must increase rapidly in ratio to the demand, until the general standard of intelligence and education is advanced in an equal degree. This will take a long period, especially as new forces are being constantly applied to even greater production and distribution. This country never needed the world for a market so much as it does now.

From this reasoning it may follow that for a very long period the rate of interest on Government bonds, mortgages and other safe investments must be very low indeed.

Finally it may be asked:

Does not the future material prosperity of this nation depend solely upon the character of its people?

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If the mental and moral characteristics of the people are equal to the opportunity which they enjoy, what will be the influence of this nation upon other countries?

Finally, there are certain conclusions that must follow from the propositions submitted in the foregoing paper, of which the following is a summary.

It has been held that the cost of railway service has been reduced not less than an average of one hundred and twenty million dollars in each year of the last decade. This is equivalent to a general relief from taxation to that extent, because the things moved by rail are mainly those of universal and common consumption.

Next it has been held that if with this saving be coupled the increased power of production ensuing from the application of more effective machinery, each human unit, *i. e.*, each man, woman or child engaged in farming, mining, metallurgy, or manufacturing, possesses a potentiality for production at least one-third greater than each unit engaged in the same pursuits possessed in the decade previous to 1870.

Under the application of these great industrial and commercial forces, capital has rapidly accumulated, and the power of accumulation may now be even greater than the power to use in a safe, well-established and customary manner.

It has been the general conviction that it would be useless to offer a United States bond, payable at a fixed date, not to be sold at less than par, at any lower rate of interest than three and one-half per cent; but may not the computations given in this paper lead to the conclusion that if a bond is offered at *three per cent.*, not redeemable or payable at a date fixed, but purchaseable by the Government at the market price when needed for the reduction of debt, such a bond may be placed at par; may there not then be greater assurance of its being maintained at par than English Consols in just such degree as our position is now safer and stronger than that of Great Britain?

This again leads to another important consideration, to wit: the expediency of ceasing for a time the rapid reduction of the debt of the United States. There may be many reasons for adopting such a course.

First.—In case the Supreme Court should righteously declare the reissue of legal tender United States notes unlawful, a large and immediate addition to the circulation of National Bank notes would be desirable, and such an issue ought to be secured, like the present issue, by the deposit of United States bonds.

Second.—Nothing would more conduce to the prosperity of many of the States, especially many of the Southern States, than the establishment of Savings Banks organized under State laws. The taint of repudiation, unfortunately forbids recourse to State or Municipal bonds as security for the investment of trust funds in many States, and until State credit is re-established it is very desirable that United States bonds should be available.

It may therefore be held that the present reduction of the debt of the United States should now be checked, and should cease for a time, when the total debt has been reduced to $1,500,000,000. This debt would then consist of the 3 per cent. consols now proposed, and the remainder might consist of the outstanding 4 per cent. bonds. The total interest would therefore be, in round figures, $54,000,000, or about $22,000,000 per annum less than it was March 1, 1881.

The reduction of debt for the year ending March 1, 1881, was $115,000,000. It is not likely to be less in any future year under our present system of taxation, as the increase of population, and the elasticity of the revenue that ensues therefrom, will fully offset the additional sums that may be added to the pension list under the unwise acts lately passed.

The debt on the 1st of March was..... $1,881,000,000

Before any action can be had to reduce the taxes, the debt may be,

January 1, 1882, below..... $1,800,000,000

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Assuming a continuous surplus revenue at the rate of the year ending March 1, 1881, in which year our interest was $77,000,000, that is to say, at the rate of		$115,000,000
Add thereto the interest to be saved by the payment or conversion of the 6 and 5 per cent. bonds into 3 per cent. consols in 1881 and 1882, say on $100,000,000 paid	$6,000,000	
Reduction of interest upon the balance	11,000,000	
		17,000,000
Available Surplus		$132,000,000

The excess of revenue for the year ensuing after January 1, 1882, may therefore be *one hundred and thirty-two million dollars.*

If it be then assumed that a reduction of debt of $32,000,000 per annum will thereafter be sufficient, a sum that, annually applied, would bring the principal of the debt to $1,500,000,000 before 1892, there would remain a further surplus of revenue of *one hundred million dollars per year, to be applied by the Congress now elected, at its next session beginning Dec.* 1, 1881, *to the reduction of the national taxes after Jan.* 1, 1882.

Peace, order and industry, free labor and free railroads have therefore brought this nation, in sixteen years from the date when nearly two million men returned to the pursuits of peace from the camps in which they had been gradually gathered during four year of civil war, to this point.

That it is entitled to the highest credit of any nation in the world, and that its legislators at the next session of Congress, only eight months distant, may apply a surplus revenue of *one hundred millions dollars to the reduction of national taxation.*

May it not therefore be hoped that the Senate of the United States will then have determined the question on which it is now engaged, as to who shall fill one or more of its petty offices, in order that when it meets in December it may be prepared to give some attention to the fiscal questions of the future; in dealing with which the reputation and political standing of each and all of its members will be made or marred. By that time it may be impossible to conceal incapacity to deal with the great questions of the future by wrangling over the dead issues of the past.

EDWARD ATKINSON.

BROOKLINE, Mass., April 8, 1881.

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LETTERS.

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LETTERS.

HOUSE OF REPRESENTATIVES, WASHINGTON, D. C., Nov. 26, 1879.

. . . . . I assure you that I feel a deep interest in the success of your enterprise. Such a National Association, if rightly conducted, cannot but be of great service to our agricultural interests, which are the great interests of the country. Agriculture is our supreme industry, and must remain so for many years. Any general improvement in its method is therefore a benefaction to our people. Consider me a friend of your enterprise, and willing to contribute to its success in any legitimate way, so far as my official duties and other engagements will permit.

Yours, &c., JAMES A. GARFIELD.

BEAUVOIR, HARRISON CO., MISS., Dec. 3, 1879.

. . . . . The greatest interest of our country is the only one which has heretofore been unsupported by any general association to promote its development and success. Commerce, by an exchange of commodities, may augment the profits of the producer; manufacturers, by incorporating human labor with raw material, may give it new forms and greater value; but from the labor of the agriculturalist, aided by the soil and the atmosphere, come the new increments to the wealth of a country

In a territory as extensive as ours, with its varied climate and production, it would be difficult to estimate the advantage which might result from a freer exchange between the agriculturalists of every section. . . . . .

It is a familiar fact that plants which are destroyed in certain regions, by the insects belonging to it, may be substituted by plants of the same genus brought from another country, and which will be free from the hazards of those they replace. For example, the phylloxera, which has of late been so destructive to the vines of France, it is understood will not attack the Scuppernong vine indigenous to the Southern States.

I have said enough to show you how highly I appreciate the purposes of your organization, and how hopeful I feel that great benefits may result from it to the agriculture of the United States, the most important interest of the country, and one in which is employed a majority of the people.

Thanking you for your courteous invitation,

I am, dear sir, yours, very truly, JEFFERSON DAVIS.

PRINCETON, Ind., Nov. 25, 1879.

I hope the efforts, of you and others associated with you, will be able to put in motion a National Agricultural Society . . . . . Wishing you great success,

Yours, &c., ROBERT MITCHELL,

Pres't Indiana State Board of Agriculture.

MILWAUKEE, Wis., Nov. 29, 1879.

. . . . . I feel a very great interest in the subject of agriculture and am impressed that such an organization as you propose cannot fail of exciting a powerful influence in its promotion.

Yours, &c., A. L. MITCHELL.

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HUNTSVILLE, Ala., Nov. 28, 1879.

. . . . . I am a cotton planter and feel a deep interest in this movement, which is in the right direction, and I most sincerely hope that your efforts may be crowned with success.

Yours, &c., L. P. WALTON.

NEW PARIS, Ky., Nov. 27, 1879.

. . . . . Being engaged in farming, and all my financial interests being involved in said vocation, I take a lively interest in the success of your efforts to form a National Agricultural Society, and place it on a firm and respectable basis.

Yours, &c., C. M. CLAY, JR.

MILFORD, N. H., Nov. 28, 1879.

. . . . . It has been the object of my life to protect and advance agriculture. I am greatly rejoiced that so many great and good men are taking hold of this subject. You shall have my hearty co-operation,

Yours, &c., B. F. HUTCHINSON.

POST OFFICE DEPARTMENT, WASHINGTON, D. C., Nov. 26, 1879.

. . . . . I recognize the benefits to be gained by such an organization, and regret that official engagements consequent upon the meeting of Congress will prevent my attendance.

Yours, &c., D. M. KEY, Postmaster-General.

STATE OF MISSISSIPPI, EXECUTIVE DEPARTMENT, JACKSON, Nov. 25, 1879.

. . . . . You may rely upon my cordial co-operation in all things looking to the advancement of American Agriculture, and to insure the representation of Mississippi in the Convention I will appoint our Representatives in Congress as delegates, all of whom are more or less interested in agriculture.

Yours, J. M. STONE, Governor of Mississippi.

WOODFORD'S, CAROLINE CO., Va., Nov. 26, 1879.

. . . . . This organization will quickly bring about general and permanent good to the agricultural interests of the nation. The farmers from all sections of our great country will come together "*face to face* for the promotion of a common interest." This alone will directly tend to make them friends. They will know each other.

Hoping you a full measure of success, and again expressing my regrets and inability to be with you,

I am, yours in spirit, JOHN WASHINGTON.

BOSTON, CONCORD & MONTREAL RAILROAD, BOSTON, Mass., Nov. 26, 1879.

. . . . . You have my best wishes that it may prove a successful movement, and be, as it necessarily must, of great interest and benefit to the paramount business involved.

Yours, I. THOMAS VOSE, President.

AUSTIN, Texas, Nov. 27, 1879.

. . . . . The remoteness of my residence would prevent me being an efficient co-worker, but I might possibly do something in behalf of that greatest material interest of our country.

Yours, &c., JOHN HANCOCK.

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BOSTON, Mass., Dec. 2, 1879.

. . . . . I give your efforts a cordial welcome, and trust that the new Society may be more permanent than the U. S. Agricultural Society, founded in 1852 and dissolved by the War of the Rebellion. Union and enterprise are the elements which will give the New Society prosperity, not only of the North and East but of the South and West.

Yours, &c., MARSHALL P. WILDER.

SUTTON, Mass., Dec. 1, 1879.

. . . . . I was a member of the old Society of 1854–60, and believed then, as I do now, that it was one of the great wants of the whole country; but, unfortunately for its further usefulness, it died in 1861, but thank God the country is one again, and prosperous in agriculture as well as in the arts. Manufacturing and mercantile interests are again returning to a state of real prosperity, and we want a Society now that will bring us to one again, broad and liberal in all its details, knowing no political and sectional differences, and it will do more toward harmonizing differences and bickerings between North and South, and developing the vast resources of the whole country, and finally paying our National debt and setting the whole country at one again, than Congress, with all its sharp politicians, can do to bring about so desirable an object.

Yours, &c., HARVEY DODGE.

U. S. SENATE CHAMBER, WASHINGTON, D. C., Dec. 4, 1879.

. . . . . Feeling so deeply interested in your enterprise, I am glad that the movement is meeting with so much success, and will be obliged to you if you will send me the proceedings of your meeting.

Yours, &c., H. G. DAVIS.

PESCADERO, Col., Nov. 21, 1879.

. . . . . I am heartily in sympathy with every movement calculated to benefit or improve agriculture. I shall feel a deep interest in the proceedings of the Convention, and shall at all times be glad to aid in promoting the object for which you propose to organize.

Yours, &c., J. C. STEELE.

UNITED STATES SENATE CHAMBER, WASHINGTON, D. C. Nov. 25, 1879.

. . . . . I wish I could be present on the occasion and give such assistance to your enterprise as I would like to do. You have my hearty sympathy with the objects of your meeting and proposed association.

Yours, &c., THOS. F. RANDOLPH.

STATE OF MINNESOTA, EXECUTIVE DEPARTMENT,
ST. PAUL, Minn., Nov. 24, 1879.

. . . . . I trust that the result of your efforts may be the substantial promotion of the great agricultural interests of the country at large.

Yours, &c., J. S. PILLSBURY, Gov'r.

ALLENTOWN, N. J., Nov. 26, 1879.

. . . . . I will give evidence of my appreciation by attending the meeting. . . . . I am greatly interested in all agricultural matters, and claim to have a large and successful experience of a practical character in all that pertains to that interest in the Middle States.

Yours, &c., W. A. NEWELL.

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U. S. SENATE CHAMBER, WASHINGTON, D. C., Dec. 2, 1879.

. . . . . I do not know when I have heard of a meeting, convention or gathering of any kind I so much approve and so cordially endorse as this. I most certainly would be present at your meeting, but my duties in the Senate will not permit me to be absent. . . . . The formation of such a society at this great centre, to be represented by men from all parts of the Union, with contributions from each section, as to the pursuits of agriculture, must do much to improve the condition of our people, and to bind them more closely together as one people in law and in fact. I hope a deep and lasting interest will be felt in this enterprise in all parts of the country, and the society prove a success in every respect, and serve to illustrate once more, what has become almost an axiom, that "in any form of government the enduring element is in the cultivators of the soil." . . . . .

I am, yours, &c., A. H. GARLAND.

FOSTORIA, O., Nov. 24, 1879.

. . . . . I trust that your meeting may result in promoting and advancing the great interest you have in charge.

Yours, &c., CHAS. FOSTER.

NATIONAL AGRICULTURAL CONGRESS, CHICAGO, Ill., Dec. 3, 1879.

. . . . . Anything that I can do to forward the work I will do cheerfully. You have my best wishes in the work you are engaged in. . . . . Do not think the "Congress" will hold another meeting, so you will have that field left to the National Agricultural Society.

Yours, &c., JONATHAN PERIAM, Sec'y.

NORTH CAROLINA RAILROAD CO., COMPANY SHOPS, N. C., Dec. 3, 1879.

. . . . . I am always in sympathy with anything that is calculated to promote agriculture. I am sorry that public duties will prevent my being present.

Yours, &c., THS. M. HOLT, President.

WEST HARPETH, Tenn., Dec. 1, 1879.

. . . . . I do with all my heart enter into the movement recommended, believing, as I do, that such an organization can best result in great good to the agricultural interests of our great and growing nation. The farmers of this section stand greatly in need of light and organization, and nothing could do more, in my humble opinion, than the organization of a National Agricultural Society. All other professions have organization; and why not the farmers? I hope this movement may meet with the encouragement it so greatly merits and the society put in working order at once. I, like many others, think it would greatly tend to unite our people in the bonds of union and fellowship, which would result in great good to all. Having been reared on a farm, and having followed that pursuit all my life, I am ready and willing at all times, when in my power, to co-operate in any movement looking to the promotion of that honorable profession. . . . . .

I am, yours, &c., JAMES P. JOHNSON.

SAN DIEGO, Cal., Nov. 24, 1878.

. . . . . An U. S. Agricultural Society, properly conducted, would benefit the whole Nation, and although at one of the extreme limits of Uncle Sam's domains, I shall be glad to be "posted" on your proceedings and to contribute my mite when I can.

Yours, &c., J. M. ASHER.

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CARBONDALE, Ill., Dec. 1, 1879.

. . . . . I can say that I am anxious to see a National Agricultural Society formed that will have vitality, and will be glad to enroll myself among your workers if I can be of any service.

Yours, &c., CYRUS THOMAS.

EXECUTIVE OFFICE, TALLAHASSEE, Fla., Nov. 28, 1879.

. . . . . No one takes a more lively interest in all matters pertaining to every department of agriculture, and none wish that your National Society may succeed more than I.

I am, &c., GEO. F. DREW, Governor of Florida.

MORRIS, Ill., Dec. 1, 1879.

. . . . . It is a step which should have been taken years ago. If properly managed, it will be an incalculable benefit to the whole country.

Yours, &c., E. SANFORD.

NEW YORK, Nov. 25, 1879.

. . . . . I feel a lively interest in the organization . . . . . Be good enough to add my name to the list of members.

Yours, &c., ELLIOT C. COWDIN.

OFFICE OF "MINNESOTA FARMER," MINNEAPOLIS, Minn., Nov. 27, 1879.

. . . . . I will say, however, in this connection, that I am pleased to learn that this movement is receiving the earnest support of representative men in all sections of the country. This journal is largely interested in the promotion of agriculture, and any word that I can say to disseminate the best agricultural thought and experience will be cheerfully given.

Yours, &c. H. F. NEWTON.

STATE OF NEW JERSEY, DEPARTMENT OF STATE, TRENTON, Nov. 1, 1879.

. . . . . I am in hearty sympathy with the movement, and shall do all I can to promote its success. If I can aid the movement in any way I shall do so with pleasure.

Yours, &c., HENRY C. KELSEY.

MUSCOGEE, Ind. Ter., Nov. 12, 1879.

. . . . . I will give it my hearty support; I am fully aware of the great good that may result from it as a mammoth school for the masses, and for the bringing forward measures productive of much good.

Yours, &c., JOHN A. FOREMAN,
Pres't of the Indian International Agricultural Fair Association
of Muscogee, Ind. Ter.

TROY, O., Nov. 26, 1879.

. . . . . Being engaged extensively in agricultural pursuits in its various branches, such an organization meets with my hearty approval. Being a member of our Legislature, which meets at the time of your meeting, I cannot be present, but if in the future I can be of any service to your Society in advancing the interests of our people, I authorize you to draw on me for anything you may think me able to contribute . . . . . .

Yours, &c. M. W. HAYES, M. D.
President Miami Agricultural Society.

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FORT ATKINSON, Wis., Nov. 25, 1879.

The organization of a National Agricultural Society is a good move in the right direction. While I cannot be at the meeting, yet I hope to be able to help you in a small way. Yours, &c., D. W. CURTIS,

Secretary Wisconsin Dairymen's Association.

INDIANAPOLIS, Ind.

I became interested in the purpose of organizing a National Agricultural Society, as you explained it to me in our conversation in your city last Summer.

Such a society can be made very useful, and should receive the support and encouragement of all who take an interest in Agriculture, the most important of all our sources of wealth. Very respectfully yours,

THOS. A. HENDRICKS.

INDIANAPOLIS, Ind.

The objects to be secured by the establishment of a National Agricultural Society on a proper basis, and in the interest of the great agricultural community of this great country, no man can calculate the benefits that will ensue. GEO. JACKSON.

MONTREAL.

I have no doubt the circulation through the press of the objects of the National Agricultural Society will attract gentlemen from Canada who are interested in agriculture.

J. HICKSON.

NORTH BEND, O., Nov. 17, 1879.

I have urged my Southern correspondents to take hold with you, as the Society should be national in its character and not sectional. By the by, this is just where its predecessors have failed in a degree. JOHN A. WARDER, M. D.

BALTIMORE, Oct. 17, 1879.

I favor the idea, and regret that I cannot be present. I would suggest, however, that the name be "Agricultural and Mechanical." JOSEPH H. RIEMAN.

ELGIN, Ill., Nov. 17, 1879.

The object of your organization is, as I fully believe, a worthy one, and one which I can and do cheerfully indorse, for I am satisfied that proper organization is what we need in agricultural matters. We should have our local clubs, our State associations, and our National organizations, just as in an army, where we have the company organization, the regiment, the brigade, the division and the corps; so in agricultural matters we should be thoroughly organized. I have seen the benefits growing out of organization and conventions in the business of the North-West, and am satisfied that effort, properly directed, will result in good. R. P. MCGLINCEY.

FRANKFORT, Ky., Nov. 17, 1879.

If the use of my name is of any service to you, you are at liberty to use it.

This year has demonstrated more clearly than ever before that the United States is the granary of the world. England and Continental Europe are henceforward to be more and more dependent on us for their bread supplies. This results from two causes—the cheapening of transportation, and the advanced positions being taken in agriculture by bringing fertilizers and improved modes of culture in aid of our naturally rich soils. Success to the National Agricultural Society. In its scope and aims it is all O. K. C. E. BOWMAN, Com. of Agric.

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POST AND TRIBUNE CO., DETROIT, Nov. 17, 1879.

I heartily sympathize with your object, and will be glad to furnish you with any reports connected with the agricultural and horticultural industries of Michigan. Would gladly act as correspondent for this State, and give you all the statistics. Something of this kind is needed, around which we may rally. J. P. THOMPSON.

KALAMAZOO, Mich., Nov. 17, 1879.

Your proposed organization of a National Society for the advancement of Agriculture is certainly worthy of the consideration of all who desire the general prosperity of our country. The highest order of science should connect itself with all branches of farming, and I know of no plan by which this can be accomplished so permanently and effectually as by bringing together the best minds of that portion of our people who are engaged in cultivating the soil. The people of the United States are apparently just entering upon a new era of prosperity, and if with increased means other processes to increase and perfect production can be inaugurated, we shall be able to meet the great demand which the rest of the world is making upon us for a food supply. The "Agricultural Societies," the "Agricultural Colleges" and the "Grange Organizations" of the several States are now making extraordinary efforts to increase the intelligence and enlarge the power of the producing classes, especially the farmers, in working in the same direction. I have no doubt but that a carefully organized "National Agricultural Society" will be an efficient aid.

H. G. WELLS.

MIDDLETOWN, Conn., Nov. 18, 1879.

One of the most important ways in which the Royal Agricultural Society has helped English farming is by the furtherance of Agricultural Science, and the need and demand for science are likewise great on this side of the Atlantic. Indications of this are abundant. I find them in letters which come to me literally by hundreds from all parts of the country, with inquiries about matters of agricultural chemistry and the like.

Now, my object in writing is simply this: my interest in farming is mainly on the scientific side. If a National Agricultural Society is to be formed, I should hope that it might place itself abreast of the times in this respect, and help vigorously and effectually in the furtherance of sound science. If it will do this, and wants such help as I can contribute, I am ready to join heartily in the work.

W. O. ATWATER.

NEBRASKA CITY, Neb., Nov. 12, 1879.

The millions of farmers in the United States ought to begin to assert the importance and dignity of their avocation. They certainly should have as much to say in affairs as tradespeople; and as much influence in moulding laws as a few hundred manufacturers; and in legislation generally, as a few thousand lawyers. It is high time that farmers who have plucked the present prosperity of the country from the furrows of their plows, should organize and exalt National Agriculture. If possible, I will be with you at the proposed meeting. J. STERLING MORTON.

RALEIGH, N. C., Nov. 15, 1879.

You have my earnest wishes for the success of the movement, and as it is positively indispensable to success and usefulness, permit me to beg of you to shield it by every possible means from the blighting, ruinous touch of sectional influence. Let it be *thoroughly national.*

If at any time I can serve the great object you have in view, command me.

L. L. POLK, Commissioner of Agriculture

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MUSCATINE, Ia., Nov 14, 1879.

The agriculture of the United States is paramount to any other industry, and I believe we may say equal in importance to all other productive industries. Our Congress and our States in their legislation have seldom given it the consideration it required. In 1862 Congress made an appropriation of lands to endow agricultural colleges, but the States and the people—except in some States where it has been properly used—have made awkward work in trying to carry out—trying to evade—the object of the donation. We have very few farmers in Congress, and very few are qualified to represent a constituency of farmers. This calls for more education.

I have often thought, and sometimes petitioned for Congress to elevate the National Agricultural Department to a first position, with a Cabinet Member. The Postmaster General is in the Cabinet councils, but the Commissioner of Agriculture is not.

The time has been when it was doubted if our Government ought to make any "internal improvements," but of late years the rivers are being improved, with liberal attention and expenditure. The land carriage is more at this time, I believe, than the water carriage in our interior. We greatly need better accommodation in railroad freights.

When the next Agricultural Congress is reported, we may see where a Cabinet counsellor could suggest assistance and improvements. SUEL FOSTER.

ALBANY, N. Y., Sept. 30, 1879.

There is only one really national association that I know of (excepting the Association of Civil Engineers) that has any vitality—I mean the American Association for the Advancement of Science, and I should hope more from the addition of an active agricultural section to that association than from the organization of a National Agricultural Society, for which, however, the other might open the way.

T. L. HARRISON.

LITTLE FALLS, N. Y., Oct. 2, 1879.

I have no doubt a National Agricultural Society, if properly organized, could be made to do great good. I am quite willing to aid you in any way I can to organize such a society. I think with the right sort of men enlisted in different sections of our broad country, a society could be organized that would prove to be a success, and be of great benefit to all classes of agriculturists. X. A. WILLARD.

WEST CHESTER, Pa., Oct. 20, 1879.

All officers of agricultural societies, farmers' clubs, granges, &c., should become members in order that those associations should be united to the National Association, and thus make it truly a Congress of Agriculture. It should be organized on a broad basis, to prevent any sectional tendencies, and to prevent its being of a puny or trifling character. The Executive Committee should consist of one member from each State, so that any action taken should be the best for the *National* Agricultural interest.

WILLIS P. HAZARD.

NEW MARKET, Tenn.

Such a society as it is proposed to organize, that will make no entangling alliance with political parties, and that will be free from grips or passwords, will commend itself to every thoughtful farmer. H. C. WHITAKER.

ALEXIS, Ill., Nov. 25, 1879.

. . . . . If something like the Grange, clipped of its secresy, formality, &c., could be maintained, the benefits would be immense. J. D. PORTER.

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SUMMERVILLE, S. C.

The tillers of the soil are the pillars of this republic. Bring them together in this time of peril, arrange them, put them in the places of order and strength, and rest this grand superstructure of liberty upon the original foundations. I hope for much from this move if preserved in its integrity of purpose. Keep out the political trickster—the trader in politics. Let the good, sterling, practical common sense of the country control this organization; bring the producers of our wealth together face to face; let them realize that it is the trade of certain ones to keep them at variance and misunderstanding, that the spoils of such contest may be theirs.

W. G. VARDELL.

CAROLINA, Tenn., Dec. 1, 1879.

The farming interests of this country are so important, so intimately blended with our prosperity, that they should be recognized by the greatest minds of our country.

H. C. ANDERSON.

NEAR NASHVILLE, Tenn., Nov. 19, 1879.

It is highly patriotic in design, and must have a very salutary influence upon the interests of breeders of the various kinds of stock, growers of the cereals, or planters of cotton and tobacco. The agricultural profession needs organization; and surely there are men enough in it whose talents, education and position qualify them for leadership in your honorable society. THOS. CLAIBORNE.

NEW MILFORD, Ct., Dec. 3, 1879.

Much has been done to elevate the calling of the American farmer, but much more remains to be done before the elements at his control shall become subservient to his will. The scholar and the chemist, the inventor and the machinist have not completed their task. AMBROSE S. ROGERS.

QUAKER CITY, O., Dec. 2, 1879.

First.—Let it *be for the nation*, and not for the benefit of any section.

Second.—Let it be for the protection and advancement of all classes of agriculturists, and not for the advancement of one class or of one interest to the neglect of others equally as useful and helpful to our advancing civilization.

Third.—Let it be managed by practical agriculturists, or men, at least, who are thoroughly identified with the producing interests of the country. W. N. COWDEN.

OCT. 15, 1879.

We need a co-operation of knowledge rather than equal division of property. Please write to J. H. Vincent, Plainfield, N. J., for circulars of his Chautauqua Literary Society, and see if his plan of study could not, by substituting agricultural studies for history, &c., be made a great engine of educational progress in the agricultural interests of this country, and be a valuable auxiliary to the society. JOHN GOULD.

OCT. 29, 1879.

The first and essential step towards success is to obtain a membership of at least 2,000 persons of influence, position and proper geographical distribution, each member to agree to pay five dollars per annum, or fifty dollars per life membership. You must have something to give coherence, because the great size of the country is the chief difficulty to contend with. T. L. HARRISON.

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NOV. 11, 1879.

The South is sorely in need of all the advice and help in her agriculture which can be derived from the discussions and investigations which will be the result of your organization. With the right men chosen in each of the Southern States, the society will indeed be "national." A. R. LEDOUX.

BRICKSBURG, N. J.

What more stupendous lever for good than the agricultural interest of these United States. Let your organization be such—discreet, wise, and practical—that you can always supply a noble fulcrum. A. S. MCLEAN.

BEECHER, Ill.

If worked to develop in a practical manner the best methods of crossing and breeding of live stock, the society will be a great benefit to the country.

T. L. MILLER.

HYCO, Va.

Have no "entangling alliances." May the organization be perfected in wisdom and the best men be put in charge. R. L. RAGLAND.

BLACKSBURG, Va.

The most important man, upon whom indeed the whole enterprise will rest, will be the Secretary. I am doubtful whether it would not be best to locate at Washington. The business meetings ought to be held separate from the show; and, in connection with them, scientific papers, discussions, &c., of the highest character ought to be provided for. Standing committees on all important subjects should be kept up, and report to the annual business meetings. Do not let the thing be simply a show.

M. G. ELLZEY.

SPOTSYLVANIA C. H., Va.

I think that our farmers are too far apart—need a tie, a connecting link by which they may each and all feel that they are parts of the vast machine which supports the world. T. H. HARRIS.

SYDNEY PLAINS, N. Y.

Its annual gatherings should be great occasions drawing together the best men of our entire land, yea more, reaching over the ocean and challenging the attention of thinking men in every civilized nation. IRA E. SHERMAN.

PURDUE UNIVERSITY, LA FAYETTE, Ind.

If there could be a series of experiments at 30 to 50 experimental stations in different parts of the country, great results would be reached. E. E. WHITE.

DAVIS JUNCTION, Ill.

Let it be purely national. Guard against narrow-minded, selfish men—they are like bad yeast in dough. Get the able and the honest, and success is sure; get the self-conceited and the selfish, and failure is just as sure. I. BOIES.

SPARTA, Ill.

Connect the small links and make one grand chain that will encompass the whole agricultural interests of this Union. MILTON E. FOSTER.

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NORTHFIELD, Mass.

By such organizations we can make Government give us our just dues.

THOS. J. FIELD.

BATAVIA.

One object which I should think it quite capable of accomplishing, would be the obtaining of statistics and the issuing of them statedly to its members in all the States.

HENRY IVES.

LIVONIA, N. Y.

In my opinion any organization having for its object the advancement of agriculture, should use as much effort in locating good ideas with the tillers of the soil as in any other way.

GEO. R. CLARK.

MONMOUTH, Ill., Nov. 27, 1879.

I have been in this work for about 27 years; I aided and assisted in organizing our Illinois State Fair, and Warren County Fair. If I am not at present with you, I would suggest to appoint or elect a Vice-President from each State in the Union, to hold their office for two years; also President for same time. Those officers to appoint Secretary and Treasurer for same time, or during good behavior.

Be sure and guard against large committees; they are hard to handle and expensive. Be very careful to select those committees with regard to their business qualifications. · · · · · · · Please excuse these suggestions. I have full confidence that a National Agricultural Society will be the means of doing immense good to the nation, and will be the means of bringing our brethren of both North and South close together.

SAMUEL DOUGLAS,
Vice-Pres't 10th District Illinois State Board of Agriculture.

GREENCASTLE, Ind., Nov. 28, 1879.

Its national character will do much for it by collecting in one body the most eminent agriculturalists of the United States, whose opinions and management must result in great good to the agricultural interests of the country. It must undoubtedly have greater ability to do good than the State institutions. Its exhibits will be from a larger sphere and of greater variety. The products of a great variety of climates and their productions may be seen and studied here. Agriculturalists of distant sections of our country will here meet and become acquainted, and form friendly and pleasant associations. The State and District Agricultural Societies have done much for agriculture, but they have not been free from some evils that their managers have thought necessary ones to secure ample premiums—good and evil often travel the same road. No such necessity will likely attend the N. A. A. It will likely be controlled by men of wealth, intelligence and morality. It should be the exemplar of all the State and District Societies, operating upon them for good, gently but surely, both by precept and example.

A. C. STEVENSON.

MOBILE, Ala., Nov. 28, 1879.

The establishment of a well conducted paper, either a weekly or monthly, would greatly augment the membership and advance the practical development of the important interests of the organization.

PRICE WILLIAMS.

NEW YORK, Dec. 2, 1879.

· · · · · · · I shall be most happy to further the proposed movement.

Yours, &c., AUG. BELMONT.

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IONIA, Mich., Nov. 26, 1879.

Whether the organization contemplated is desirable or beneficial, depends upon the men composing it, and I sincerely trust that our best men in every State can be induced to take some degree of interest in the undertaking. ALONZO SESSIONS.

INDIANAPOLIS, Ind., Nov. 25, 1879.

Your address before the Preliminary Meeting suggests an object worthy of the efforts of such an organization, if there is any reasonable hope of its accomplishment. I allude to the fact you state that Government has retarded rather than advanced the growth of American agriculture. If the N. A. S. can command the attention of Congress, and influence that body to legislate in favor of agricultural interests, the organization will be worthy of the energetic efforts you are making in its behalf.

J. G. KINGSBURY.

FISHERVILLE, Va., Nov. 28, 1879.

I fully appreciate the importance of the Society, not only for the better promotion of agriculture in its immense and controlling results upon our country, but for the great advantage of bringing our people together from all quarters of our great country, and making them personally acquainted and interested in the individual welfare of every member, and the consequent fraternizing and cementing in love and attachment of our people as one family in interest and affection. ABSALOM KOINER.

HOUSE OF REPRESENTATIVES, WASHINGTON, D. C., Nov. 28, 1879,

Being a member of the Committee on Agriculture, you may be assured of my readiness to examine all constitutional plans to further the greatest of all the interests possessed by the people of this country. WALTER K. STEELE.

STACYVILLE, Iowa, Nov. 27, 1879.

. . . . . I am delighted with the move, and shall be very glad to do all in my power to forward the interests of the National Agricultural Society. It is the interests of the masses and the foundation of all the material interests of our country.

Yours, &c., FITCH B. STACY.

LOUISVILLE, CINCINNATI AND LEXINGTON R. R. CO.,
LOUISVILLE, Ky., Nov. 28, 1879.

. . . . . I shall take great pleasure in becoming a member of the Society and lending my best efforts to promote its success and prosperity.

J. W. WILDER, Pres't.

NEW ORLEANS, La., Nov. 28, 1879.

. . . . . I wish the Association complete success, owing to its great importance to the agricultural prospects of the country.

Yours, &c., G. T. BEAUREGARD.

VIA HERNDON, Ga., Dec. 1, 1879.

. . . . . I can only express my cordial co-operation with this effort to organize a National Agricultural Society on the broad and liberal basis you propose, to advance the interests of agriculture and the tiller of the soil, by an organization as extensive and practical as our broad country and its varied interest demands. I hope to be still a co-laborer with you.

Yours, &c., W. B. JONES.

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INDIANAPOLIS, PERU AND CHICAGO R. R. CO.,
INDIANAPOLIS, Ind., Dec. 2, 1879.

. . . . . I am, in a limited way, engaged in agriculture, and feel a deep interest in any movement that has for its object protection and advancement in America, especially in the West; and I trust that the action of the contemplated convention will lead to good results, and that they will form a society that the American people engaged in agriculture will rally round, encourage and support. No country on the globe has so favorable a soil and climate for the various kinds of agriculture as we have in America, which we should certainly encourage and improve.

Yours, &c., DAVID MACY, Pres't.

TRENTON, N. J., Dec. 3, 1879.

. . . . . In looking over the names and residences of persons calling the meeting, I am glad to observe that many are from the Southern States. Apart from the national importance of such an organization as an instrument in the development of our agricultural wealth, its influences must be good in allaying sectional animosity and strife. Every society which brings face to face the leading representative men of the two sections should be encouraged by every patriot, for the effect of all such is the promotion of the national unity.

Yours, &c., JNO. T. NIXON.

STATE OF MAINE, EXECUTIVE DEPARTMENT, AUGUSTA, Me., Dec. 2, 1879.

. . . . . The interests of agriculture are paramount to all other interests, and whatever can be done to advance its future development, or awaken an interest for its efficiency and progress, is to be commended, and should receive the sanction of every true lover of his country. . . . . I shall be happy to aid the organization in every way within my power in the future.

Yours, &c., ALONZO GARCELON, Gov'r.

ARCHBISHOPRIC OF NEW YORK, 32 W. 56th St., N. Y., Dec. 6, 1879.

I beg to acknowledge with cordial thanks the receipt of your kind invitation to attend a meeting for the formation of a "National Agricultural Society," to be held in this city on Wednesday, Dec. 10, at the Metropolitan Hotel.

I regret to say that it will not be in my power to be present at the meeting, but you will permit me to assure you that the objects which you have in view have my hearty approval and my best wishes for their success.

Very respectfully yours, JOHN, CARD'L MCCLOSKEY,
Archb'p of New York.

WHITE HALL, Ky., Dec. 2, 1879.

. . . . . I trust the great enterprise will go on and be a success. I don't think the vast extent of our country will war against the scheme, but rather the contrary; besides, you have a great city as a nucleus, and a great State to back you at once. When I was in New York in 1869–70, something akin to the project was urged by me—an international exhibition, permanent and universal in its objects and aims—but it fell into the hands of men of personal greed and questionable honesty, became "a ring," and I was swindled and retired from it with a *protest*—which the great papers of the city *mutilated* to save some men's character, and *emasculated* it!! This society might ultimately accomplish all that was then proposed—but may stop short of it, and yet do a great work.

Yours, &c., C. M. CLAY.

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PENNSYLVANIA R'Y COMPANY, PITTSBURGH, Pa., Nov. 26, 1879.

. . . . . I trust that the organization of your society will be an entire success.

Yours. &c., J. N. MCCULLOUGH, First Vice-President.

MINNESOTA STATE REFORM SCHOOL, ST. PAUL, Minn., Dec. 2, 1879.

. . . . . I most heartily approve of the object in view. The State of Minnesota is deeply interested in every movement for the development of our agriculture, and may I express the hope that the best measures may be inagurated to foster and encourage them.

Yours, &c,, D. W. INGERSOLL, Pres't.

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BOOKS AND PUBLICATIONS RECEIVED.

"Agricultural Report of Illinois, 1877."
"Agricultural Report of Illinois, 1878."
"Agricultural Report of Kentucky, 1879."
"A Hand-Book of Virginia." By THOS. POLLARD, Commissioner of Agriculture.
"Annual Statement Iowa State Agricultural College, 1876-77."
"Catalogue of Centennial Exhibition."
"Census State of New York."
"Commerce and Navigation of United States."
"Commercial Relations of the United States with Foreign Countries," Treasury Department, U. S.
"Compendium of Ninth Census, United States."
"Diseases of Swine and Other Animals."
"First Biennial Report of the Kansas State Board of Agriculture, 1877-1878."
"Hand-Book of North Carolina." 1879.
"Horticultural Report of Illinois, 1878."
"Iowa Agricultural Report, 1874."
"Iowa Agricultural Report, 1879."
"Iowa Agricultural Report, 1874-1879."
"Journal of the Royal Agricultural Society of England."
"Journal of the Royal Agricultural Society, 1880."
"Kentucky Agricultural Report, 1879."
Pamphlet on "Indian Corn." By Dr. E. LEWIS STUETEVANT.
"Report of Agricultural Society of Indiana, 1879."
"Report of American Association of Nurserymen, Florists and Seedsmen, 1879-1880."
"Report of Antwerp Society of Commerce, Industry and Maritime, 1878."
"Report of Baltimore Corn and Flour Exchange, 1878."
"Report of Bureau of Statistics of Labor and Industries of New Jersey, 1878."
"Report of the California State Agricultural Society, 1879."
"Report of the Canal Department of the State of New York."
"Report of Commissioner of Statistics State of Minnesota, 1878."
"Report of Connecticut Board of Agriculture and Experiment Station, 1878-79."
"Reports of Department of Agriculture, 1877-78-79."
"Report of Detroit Board of Trade, 1878."
"Report on Foreign Commerce."
"Report of General Land Office, 1878."
"History of the Highland Agricultural Society of Scotland."
"Report Illinois State Board of Agriculture, 1877, 1878, 1879."
"Report of Illinois State Horticultural Society, 1878-79."
"Report of Indiana State Board of Agriculture, 1877 and 1878."
"Report Inter-State Agricultural Convention." Springfield, Ill. 1880.
"Report Iowa State Agricultural College."
"Report of the Iowa State Agricultural Society, 1878."
"Report of Kansas State Horticultural Society, 1878."
"Report of Kansas Horticultural Society, 1879."
"Report of Kentucky Board of Agriculture, Horticulture and Statistics, 1879."
"Report Massachusetts Agricultural College, 1880."
"Report Massachusetts Horticultural Society, 1879."
"Report of the Massachusetts Horticultural Society, 1880." Part 1.
"Report of Massachusetts State Board of Agriculture, 1878-79."
"Report of Montreal Horticultural Society, 1879."
"Report of New Jersey State Agricultural Society, 1878."
"Report New Hampshire State Board of Agriculture, 1878."
"Report of the New Hampshire Board of Agriculture, 1875, 1876, 1877, 1878, 1879."
"Report of New York Produce Exchange, 1878."

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"Report of Nebraska State Horticultural Society, 1877."
"Report of North Carolina Experiment Station."
"Report of Northern Mississippi Agricultural and Mechanical Society, 1878-79, 1879-80."
"Reports Northern Wisconsin Agricultural and Mechanical Association."
"Report North Carolina Board of Agriculture, 1880."
"Report Ohio State Board of Agriculture, 1877-78-79."
"Report of Ohio State Horticultural Society."
"Report of Paris Chamber of Commerce and Agriculture, 1878."
"Report of Pennsylvania State Agricultural Society, 1877."
"Report of Philadelphia Board of Trade, 1878."
"Report of Prussian Department of Agriculture," etc.
"Report of Rutgers Scientific School." New Jersey. 1878. State College.
"Report of San Francisco Chamber of Commerce, 1878."
"Report of St. Louis Merchants' Exchange, 1878."
"Report of Toledo Produce Exchange, 1878."
"Report of U. S. Bureau of Statistics." Parts 1 and 2. 1878.
"Reports Vermont State Board of Agriculture, 1877 and 1878."
"Report of the Wisconsin State Dairyman's Association, 1879."
"Sheep Husbandry in the United States."
"State of Labor in Europe." Treasury Department. 1879.
"The Great Industries of the United States."
"Transactions of the New York State Agricultural Society," 1872 to 1876.
"Transactions of the Wisconsin State Agricultural Society," 1877-78, 1878-79, 1879-80.
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"Agricultural Gazette" (London.)
"American Farmer."
"Chambers of Agriculture Journal" (London, Eng.)
"Maryland Farmer."
"New England Homestead."
"New England Farmer."
"Ohio Farmer."
"The Jefferson County Union" (Wis.)
"The Elgin Advocate."
"The Provisioner" (London, Eng.)
"The Farmers' Review."

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CHARTER, CONSTITUTION AND BY-LAWS

OF THE

AMERICAN AGRICULTURAL ASSOCIATION.

CHARTER.

THE subscribers, being persons of full age, citizens of the United States, and a majority residents of the State of New York, who desire to form themselves into an association for the purpose of protecting, promoting and developing agriculture in the United States in all its branches, and the interests of those engaged therein and connected therewith, pursuant to the provisions of an Act of the Legislature of the State of New York, entitled "An Act for the Incorporation of Societies or Clubs for Certain Lawful Purposes," passed May 12th, 1875, and the Acts amendatory thereof, do hereby certify:

First.—The name or title by which such association shall be known in law is American Agricultural Association, and its principal office shall be situated in the City and County of New York.

Second.—The particular business and object of such association is and shall be the protection, promotion and development of agriculture in the United States, in all its branches, including the rearing and breeding of stock of all kinds and the protection of their health. The means employed shall be the association, organization and co-operation of its members; periodical and migratory meetings for deliberation, discussion and business; correspondence and publications, scientific investigations, and such other means as may be proper and expedient, including exhibitions.

Third.—That said association shall have the right to hold agricultural fairs, exhibitions and meetings, to offer premiums, issue certificates, medals and diplomas, and other marks of merit, and to do and perform any other act or thing not inconsistent with the object of its incorporation.

Fourth.—The affairs of the said association shall be managed by a board of trustees, directors, or managers. The trustees shall be five in number, and the names for the first year of the existence of the said association are as follows: GEO. A. CRAWFORD, M. FOLSOM, T. MORTIMER SEAVER, J. H. REALL, FRANCIS D. MOULTON.

CONSTITUTION.

ARTICLE I.—NAME AND OBJECTS.

SECTION 1. The name of this organization shall be the American Agricultural Association.

SECTION 2. The objects of this Association shall be to protect, promote and develop the agriculture of the whole country, in all its branches, and the interests of those engaged therein and closely connected therewith.

SECTION 3. The means employed shall be the association, organization and co-operation of its members; periodical and migratory meetings for deliberation, discussion and business; correspondence and publications, and such other means, including exhibitions, as may be proper and expedient.

SECTION 4. There shall be a total exclusion from the meetings of the Association, its proceedings and publications, of all questions of a partisan character.

ARTICLE II.—MEMBERSHIP.

SECTION 1. Any person may become a member of this Association by signing a form of declaration prepared for the purpose, expressing his personal interest in its objects, his desire to further the same, and his willingness to abide by its Constitution and By-Laws, and also by paying to the Association the sum of one dollar registration fee and such annual dues as the By-Laws may prescribe.

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SECTION 2. Membership shall continue indefinitely upon the payment of such dues and the performance of such obligations as may be duly imposed. Membership may be terminated by resignation, or by a two-thirds vote of all the Directors, for cause, and shall cease upon failure to make payments required by first section of this article during two consecutive calendar years, due notice of such failure having been served upon the delinquent member.

SECTION 3. The payment to the Association of the sum of fifty dollars at one time by any person, together with the declaration prescribed by Article I, shall constitute such person a life member. Life members shall be entitled to all the rights and privileges of members, and shall be free from all assessments and payments, but they shall perform such other duties and obligations as may be imposed upon members in general for the good of the Association.

SECTION 4. The payment to the Association of the sum of one thousand dollars at one time by any person, together with the declaration above prescribed, shall constitute such person an Advisory Director. Advisory Directors shall be entitled to all the rights, privileges and immunities of life members, shall be subject to like obligations, and shall be entitled to be present at all meetings of the Directors, in which they shall have a voice but no vote, except that in meetings where said vote shall be necessary to make a quorum it may be counted.

SECTION 5. The Directors may, by a majority vote, elect corresponding and honorary members. Such members shall have the rights and privileges of life members.

ARTICLE III.—MEETINGS.

SECTION 1. There shall be a general meeting of the Association held annually at such time and place as the By-Laws shall designate, due notice being given to every member.

SECTION 2. At every annual general meeting the officers shall make a full report of the finances of the Association, and of the business transacted by them during the year.

SECTION 3. At every annual general meeting, immediately following the reports, an Auditing Committee of three shall be chosen from the members present, not officers, to examine the accounts of the Association, and report upon the condition of the same to the meeting before adjournment.

SECTION 4. There shall be such other meetings of the Association as may be ordered by the Directors, upon their giving due notice to the members through the Secretary.

ARTICLE IV.—OFFICERS.

SECTION 1. At the annual general meeting there shall be chosen by ballot from the members a President and Senior Vice-President, a Secretary, a Treasurer, and thirteen Directors, who together shall constitute a Board of Directors and have the management of all the affairs of the Association, and shall do whatever may appear necessary or desirable for the purpose of carrying into effect the objects of the American Agricultural Association. There shall also be elected annually five Trustees. At the first meeting in each year the Directors shall determine the number necessary to constitute a quorum of their body, provided it be not less than seven members. The term of their service shall be the year following such choice. There shall also be chosen to serve during the same term one Vice-President for each State and Territory.

ARTICLE V.—FINANCES.

SECTION 1. All receipts from life members and Advisory Directors, and all bequests and gifts, not by their terms to be otherwise applied, shall go to form the permanent fund of the Association, and shall, at such times as may be determined by the Directors, be invested in the bonds and interest-bearing securities of the Government of the United States. The income of the permanent fund may be applied to the uses of the Association, by a majority vote of the Directors; but it shall require a four-fifths vote of all the Directors to expend any part of the principal.

ARTICLE VI.—AMENDMENTS AND BY-LAWS.

SECTION 1. This Constitution may be altered or amended upon recommendation of the Directors, by a two-thirds vote of the members present at any general meeting.

SECTION 2. By-laws to govern the management of the affairs of the Association, not inconsistent with the Constitution, shall be enacted by the Directors at their first meeting. Such by-laws shall be in force until repealed by a general meeting of the Association, or by a meeting of the Directors. But no change shall take effect until the meeting following the one at which it is adopted.

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BY-LAWS.

ARTICLE I.—OF MEETINGS.

SECTION 1. It shall require the presence of at least fifteen members of the Association to constitute a quorum for the transaction of business at a meeting of the Association; but a less number can adjourn from time to time.

SECTION 2. The annual meeting of the Association shall be held on the first Wednesday in February.

SECTION 3. The Board of Directors shall hold stated meetings quarterly on the first Wednesdays of February, May, August and November, for the election of members and the transaction of such other business as may be properly brought before it. Seven members shall constitute a quorum. Special meetings shall be called by the President upon the written request of three members. Ten days' notice of the meeting, and of the business to be brought before it, shall be given to each member. No business shall be transacted at a special meeting except that mentioned in the call.

ARTICLE II.—OF OFFICERS AND THEIR DUTIES.

SECTION 1. The President shall preside at all meetings of the Association and of the Board of Directors and shall be *ex-officio* a member of all the Standing Committees.

SECTION 2. The Senior Vice-President shall perform the duties of the President in his absence.

SECTION 3. The Secretary shall keep all records of the Association and of the Board of Directors; shall make a correct record of the proceedings of each body; conduct the correspondence appertaining to his office; keep the Seal and issue certificates of membership under the same, and, with the co-operation of the Committee on the Journal, prepare all publications emanating from the Society. He may, with the approval of the Finance Committee, appoint assistants and employ such help as may be necessary for the proper conduct of the affairs of the Association.

SECTION 4. The Treasurer shall receive and disburse the funds of the Association, upon the orders of the President, countersigned by the Secretary, and shall give a bond for such an amount as may be required by the Board of Directors.

SECTION 5. The Board of Directors shall perform the duties prescribed in the Constitution and shall fill all vacancies in the Officers and Committees of the Association until a regular election shall be held.

SECTION 6. The Vice-Presidents shall represent the agricultural interests of their respective States in the Association, and the interests of the Association in their States, and co-operate with the Directors in promoting the same.

ARTICLE III.—OF COMMITTEES.

SECTION 1. There shall be the following Standing Committees, of five members each, appointed by the President at the first regular meeting of the Board of Directors in each year, viz.: 1, Finance; 2, Journal; 3, Exhibitions; 4, Chemistry; 5, Botany; 6, Diseases of Live Stock; 7, Agricultural Engineering; 8, Immigration. The Chairman of each shall be the first person named upon it, and Committees shall report annually, or oftener, through said Chairman, to the Association.

SECTION 2. It shall be the duty of the Committee on Finance, subject to the approval of the Directors, to determine the investment of the permanent fund of the Association, and to make all changes in such investments; to supervise the accounts of the Association kept by the Treasurer, and to devise ways and means for defraying all extraordinary expenditures of the Association. The Treasurer shall be *ex-officio* an additional member of this Committee.

SECTION 3. It shall be the duty of the Journal Committee to determine what publications shall be made by, and in the name of, the Association, subject to the approval of the Directors, and to assist the Secretary, as Editor, in procuring the material therefor and in preparing the same. The Secretary shall be *ex-officio* an additional member of this Committee.

SECTION 4. The Committee on Exhibitions shall have all propositions for holding exhibitions, and matters in relation thereto, referred to it, and it shall investigate and report upon the same to the Directors with recommendations. Under the general control of the Directors, the Exhibition Committee shall be charged with the preliminary arrangements attending all exhibitions determined upon.

SECTION 5. The Committees on Chemistry, on Botany, and on the Diseases of Live Stock, shall respectively and gratuitously reply to questions on Agricultural Chemistry, on Agricultural Botany, and on the Diseases of Farm Animals, provided that these questions do not require special investigation, and that they have been propounded by members of the Association through the Secretary. Questions involving special investigation shall receive attention only upon the fees for the same being paid to the Committee

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by parties making the inquiries. Copies of all questions and replies shall be kept on file by the Committees and prepared from time to time for publication in the Journal.

SECTION 6. The Committee on Agricultural Engineering shall prepare from available and trustworthy sources, and present to the Association at every annual general meeting, a description of works in progress or recently completed, designed for the purposes of Irrigation, Drainage, Reclaiming of Land from Water and Waste, Sewage utilization and the maintenance of the purity of Water Supply; and also a summary of the latest improvements in the making and repairing of Highways and Farm Roads, and in Agricultural Machinery.

SECTION 7. The Committee on Immigration shall take cognizance of the Federal and State enactments on immigration; shall obtain available and reliable information respecting the inducements offered by the several States and Territories inviting immigration, their advantages of climate, soil and productions, and shall report such information annually for publication in the Journal.

SECTION 8. Committees shall meet at the summons of their respective Chairmen, and at such times and places as may be designated in the summons. The Chairman of any Committee shall call a meeting thereof upon the written request of three members. Except in the case of an adjourned meeting, every member of a Committee shall be notified at least five days prior to the time of a proposed meeting. A majority of members shall constitute a quorum.

SECTION 9. No Committee shall make any expenditure or incur any debt in excess of funds previously assigned for its use by the Board of Directors.

ARTICLE IV.—OF ANNUAL DUES.

SECTION 1. The dues of annual members shall be two dollars, payable in advance for the year, on the first day of January; but members joining the Association after the first day of October, and paying their dues, shall be entitled to credit for the same from the first of the succeeding January. Every life member and every annual member not in arrears shall be entitled to a copy of the Journal, to free admission to the exhibitions of the Association, and to free advice on any subject not requiring special investigation and within the sphere of the Committees on Chemistry, Botany, and Diseases of Live Stock. All applications for membership shall be passed upon by the Board of Directors. A member may withdraw from the Association by giving notice to the Secretary and paying all arrears of dues.

ARTICLE V.—OF AMENDMENTS.

SECTION 1. These By-Laws may be altered or amended at any regular meeting of the Association, or of the Board of Directors, by a two-third vote of the members present, and subject to the provisions of the Constitution.

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OFFICERS FOR 1880.

President,
JOHN MERRYMAN, MARYLAND.

Senior Vice-President,
N. S. TOWNSHEND, OHIO.

Secretary,
*JOSEPH H. REALL.

Treasurer,
LAWSON VALENTINE, NEW YORK.

Vice-Presidents.

J. R. BODWELL, Maine.
MOSES HUMPHREY, New Hampshire.
J. GREGORY SMITH, Vermont.
DANIEL NEEDHAM, Massachusetts.
EDWARD D. PEARCE, Rhode Island.
E. H. HYDE, Connecticut.
LAWSON VALENTINE, New York.
DAVID TAGGART, Pennsylvania.
GEO. H. COOK, New Jersey.
HENRY M. RIDGLEY, Delaware.
EZRA WHITMAN, Maryland.
C. V. RILEY, Washington, D. C.
GILBERT S. MEEM, Virginia.
L. L. POLK, North Carolina.
D. WYATT AIKEN, South Carolina.
J. W. AVERY, Georgia.
J. T. TICHNOR, Alabama.
J. L. ALCORN, Mississippi.
J. FLOYD KING, Louisiana.
ASHABEL SMITH, Texas.
GEO. F. DREW, Florida.
JOHN D. ADAMS, Arkansas.
T. C. HENRY, Kansas.
D. H. WHEELER, Nebraska.
ROGER W. WOODBURY, Colorado.
G. C. SWALLOW, Missouri.
J. B. KILLEBREW, Tennessee.
CASSIUS M. CLAY, Kentucky.
HENRY G. DAVIS, West Virginia.
J. C. STEVENS, Ohio.
CLAUDE MATTHEWS, Indiana.
J. D. GILLETT, Illinois.
H. G. WELLS, Michigan.
CHESTER HAZEN, Wisconsin.
C. W. THOMPSON, Minnesota.
JOHN SCOTT, Iowa.
JOHN P. JONES, Nevada.
S. G. REED, Oregon.
JOHN BIDWELL, California.
JOHN A. FOREMAN, Indian Territory.

Directors.

N. T. SPRAGUE, Vermont.
A. M. FULFORD, Maryland.
NORMAN J. COLMAN, Missouri.
PETER MURPHY, Michigan.
THOS. M. HOLT, North Carolina.
THOS. A. GALT, Illinois.
HENRY HUBBARD, California.
HENRY E. ALVORD, Massachusetts.
A. L. KENNEDY, Pennsylvania.
A. T. A. TORBETT, Delaware.
J. B. GRINNELL, Iowa.
PRICE MAGRATH, Kentucky.
ROBERT BEVERLY, Virginia.
POWELL CLAYTON, Arkansas.
FREDERICK SMYTH, New Hampshire.
N. M. CURTIS, New York.
W. S. KING, Minnesota.
M. J. LAWRENCE, Ohio.
J. T. HENDERSON, Georgia.

Executive Committee.

N. M. CURTIS,
FREDERICK SMYTH,
W. S. KING,
N. T. SPRAGUE,
A. L. KENNEDY,
JOHN MERRYMAN,
N. S. TOWNSHEND.

*Resigned January 25th, 1880, and succeeded by Major Ben Perley Poore.

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OFFICERS FOR 1881.

President,
Col. N. T. SPRAGUE, of Vermont.

Senior Vice-President,
Dr. JOHN A. WARDER, of Ohio.

Secretary and Editor,
J. H. REALL, 127 Water Street, New York.

Treasurer,
HENRY M. McLAREN, New York.

Trustees.

Geo. A. Crawford,
M. Folsom,
T. Mortimer Seaver,
J. H. Reall,
Francis D. Moulton.

Board of Directors.

Henry E. Alvord, Massachusetts.
Alfred L. Kennedy, Pennsylvania.
T. T. Kinney, New Jersey.
J. B. Grinnell, Iowa.
Thomas A. Galt, Illinois.
Robert Beverley, Virginia.
Francis D. Moulton, New York.
W. S. King, Minnesota.
N. T. Sprague, Vermont.
Jos. H. Reall, New York.
H. M. McLaren, New York
John A. Warder, Ohio.
M. J. Lawrence, Ohio.
J. T. Henderson, Georgia.
E. M. Richardson, Mississippi.
Geo. A. Crawford, Kansas.
George Hammond, Vermont.

Vice-Presidents.

W. H. Chambers, Alabama.
Powell Clayton, Arkansas.
Charles H. Shinn, California.
N. P. Hill, Colorado.
E. H. Hyde, Connecticut.
C. V. Riley, District of Columbia.
John Scott, Iowa.
T. C. Henry, Kansas.
Henry M. Ridgely, Delaware.
George F. Drew, Florida.
Thos. P. Janes, Georgia.
J. D. Gillett, Illinois.
T. F. Shafer, Idaho.
Claude Matthews, Indiana.
Daniel Needham, Massachusetts.
H. G. Wells, Michigan.
Cassius M. Clay, Kentucky.
J. Floyd King, Louisiana.
J. R. Bodwell, Maine.
A. M. Fulford, Maryland.
D. H. Wheeler, Nebraska.
John P. Jones, Nevada.
Moses Humphrey, New Hampshire.
James Neilson, New Jersey.
T. R. Stuyvesant, New Mexico.
C. W. Thompson, Minnesota
A. L. Alcorn, Mississippi.
William Gentry, Missouri.
J. M. Cavanaugh, Montana.
T. M. Holt, North Carolina.
John C. Stevens, Ohio.
S. G. Reed, Oregon.
David Taggart, Pennsylvania.
J. Erastus Lester, Rhode Island.
J. R. Killebrew, Tennessee.
Ashbel Smith, Texas.
George G. Cannon, Utah.
H. G. Root, Vermont.
G. S. Meen, Virginia.
Henry G. Davis, West Virginia.
D. Wyatt Aiken, South Carolina.
Chester Hazen, Wisconsin.
J. W. Hoyt, Wyoming.
Jno. A. Foreman, Indian Territory.

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STANDING COMMITTEES.

Finance,

FRANCIS D. MOULTON, New York.
GEO. A. CRAWFORD, Kansas.
THOMAS A. GALT, Illinois.
FRED'K SMYTH, New Hampshire.
GEORGE HAMMOND, Vermont.

Journal,

H. E. ALVORD, Massachusetts.
E. H. LIBBY, Chicago.
W. H. C. PRICE, New York.
M. J. LAWRENCE, Ohio.
THOMAS W. HOLLOWAY, South Carolina.

Chemistry,

PETER COLLIER, Dist. of Columbia.
W. O. ATWATER, Connecticut.
A. R. LEDOUX, New York.
C. U. SHEPARD, South Carolina.
CHAS. H. GOESMANN, Mass.

Botany and Forestry,

JOHN A. WARDER, Ohio.
P. T. QUINN, New Jersey.
C. L. FLINT, Massachusetts.
PETER HENDERSON, New York.
GEO. C. BRACKETT, Kansas.

Cattle Disease,

JAMES LAW, Cornell University, N.Y.
Prof. ELLERY, Virginia.
J. B. GRINNELL, Iowa.
WILLIAM GENTRY, Missouri.
D. H. WHEELER, Nebraska.

Exhibitions,

FRED'K SMYTH, New Hampshire.
E. M. RICHARDSON, Mississippi.
GEO. A. CRAWFORD, Kansas.
ROBERT BEVERLEY, Virginia
W. S. KING, Minnesota.

Agricultural Engineering,

A. L. KENNEDY, Pennsylvania.
S. W. SHATTUCK, Illinois.
E. W. HILGARD, California.
H. E. ALVORD, Massachusetts.
MANLY MILES, New York.

Immigration.

N. S. BAILEY, New York.
EDWARD MCINTYRE, Nebraska.
A. M. FULFORD, Maryland.
J. ERASTUS LESTER, Rhode Island.
H. H. YOUNG, Minnesota.

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LIST OF MEMBERS.

LIFE MEMBERS.

N. T. SPRAGUE, JAMES YOUNG,
LAWSON VALENTINE, JOHN MERRYMAN,
JOHN A. FOREMAN.

Atkinson, Edward.....Boston, Mass.
Adams, Jno. D.....Little Rock, Ark.
Atwater, W. O.....Middletown, Ct.
Adams, Jno.....Kerrville, Tenn.
Amsdell, T. M.....Albany, N. Y.
Andrews, R. H.....Wyoming, O.
Achelis, Geo.....West Chester, Pa.
Apperson, Jno. S.....Town House, Va.
Aiken, D. Wyatt.....Washington, D. C.
Aspinwall, E.....New York City.
Alvord, Henry E.....East Hampton, Mass.
Armstrong, Thos.....Plattsburg, N. Y.
Armstrong, W. N.....Hampton, Va.
Arnold, Ewd.....Ponca, Neb.
Alcorn, J. L.....Friar's Point, Miss.
Aultman, Taylor C.....Mansfield, O.
Ammen, Daniel.....Washington, D. C.

Bates, E. S.....New York City.
Baker, B. P.....New York City.
Barrett, Wm. E.....Providence, R. I.
Bailey, N. S.....New York City.
Blanchard, Geo.....Portland, Me.
Baldwin, J. D.....Ann Arbor, Mich.
Battle, K. P.....Chapel Hill, N. C.
Branch, E. K.....Bordelouville, La.
Brady, J. T.....Houston, Tex.
Beadle, E. L.....Poughkeepsie, N. Y.
Brewer, Wm. H.....New Haven, Ct.
Bennett, F. G .....New York City.
Beverly, Robt.....The Plains, Va.
Breinig, A. J.....Allentown, Pa.
Benham, C. B.....Hastings, Mich.
Beirne, O..... ..... Sweet Springs, W. Va.
Beebe, H. Y..... .....Ravenna, O.
Bissell, W. S.....Pittsburg, Pa.
Bissell, Dr. J. H.....Minneapolis, Minn.
Blight, Geo.....Philadelphia, Pa.
Bristol, R. T.....Vergennes, Vt.
Bishop, D. B..... .....Richmond, Vt.
Boucher, W. M.....New York City.
Brackett, G. C.....Lawrence, Kan.
Brown, J. F..... .....Lunenburg, Mass.
Bodwell, J. R.....Hallowell, Me.
Brown, O.....Providence, R. I.
Brown, J. C .....Skaneateles, N. Y.
Brown, S. C.....Trenton, N. J.
Burchard, P.....Grant Park, Ill.
Butterworth, T.... .....Quincy, Ill.
Bush, I .... St. Louis, Mo.
Buckingham, S. M.....Poughkeepsie, N. Y.
Buckley, W.....Port Jervis, N. Y.
Burdett, Jno.... .....La Salle, N. Y.
Butler, A. H..... New York City.
*Bateham, W. B.....Painesville, O.

Clayton, Powell.....Little Rock, Ark.
Crawford, Geo. A.....Fort Scott, Kan.
Carey, S.....Syracuse, N. Y.
Carmen, E. A.....Washington, D. C.
Chambers, G. T.....New York City.
Crawford, M.....Cuyahoga Falls, N. Y.
Clay, C. M.....Whitehall, Ky.
Claiborne, Thos.....Nashville, Tenn.
Carpenter, L.....Kelly's Island, O.
Clark, W. G.....Chelsea, Mass.
Crane, Jno.....Union, N. Y.
Cleemann, B. C.....New York City.
Cheever, A. W. .....Sheldonville, Mass.
Conover, G. R.....Trenton, N. J.
Clough, D. M.....Canterbury, N. H.
Coffin, C. H.....New York City.
Conover, W. A.....Trenton, N. J.
Collier, Peter.....Washington, D. C.
Colman, M. J.....St. Louis, Mo.
Coleman, J. W.....Pickering, Mo.
Comstock, J. H.....Washington, D. C.
Curtis, N. M.....Ogdensburg, N. Y.
Clute, Louis G.....Manchester, Ia.
Curlett, T. S.....Litwalton, Va.
Curtis, Geo. Wm.....Staten Island, N. Y.

Darlington, Jared.....Darling, Pa.
Darlington, Jesse.....Darling, Pa.
Dana, C. H..... ...West Lebanon, N. H.
Davis, H. G.....Piedmont, W. Va.
Daggy, Peter.....Chicago, Ill.
Danforth, G. P .....New York City.
Davis, Jefferson.....Beauvair, Miss.
Drennen, W. F.....Philadelphia, Pa.
Dederick, P. K.....Albany, N. Y

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De Graff, C. A.....St. Paul, Minn.
Dewey, Geo. M.....Hastings, Mich.
Drew, Geo. F.....Ellaville, Fla.
De Mott, Jno.....Middlebush, N. J.
Derby, G. A.....Utica, Neb.
Dean, Wm.....Newark, Del.
Dikeman, E. B.....Grand Rapids, Mich.
Dodge, H.....Sutton, Mass.
Doty, Wm. E.....Brooklyn, N. Y.
Dudley, A. W.....Exeter, N. H.
Dunnington, F. P.....Albemarle, Va.
Drummond, V. A. W.....British Legation, Washington, D. C.

Evatt, Wm.....Lawrence, Kan.
Emerson, G. W.....South Barnstead, N. H.
Elliott, Wyman.....Minneapolis, Minn.
Elliott, F. B.....Lyons, Minn.
Eddy, Robt. H.....New York.

Francis, Emery W.....Cane Creek, Ala.
Fairlamb, C. C.....Chicago, Ill.
Frame, Paynter.....Harbeson, Del.
Failer, And.....Newton, Ia.
Freeman, H. O.....Sherburne, N. Y.
French, J. D. W.....North Andover, Mass.
Flint, C. L.....Boston, Mass.
Foreman, J. A.....Muscogee, Ind. Ter.
Fowler, J. D.....San Luis Obispo, Cal.
Foster, S.....Muscatine, Ia.
Fulford, A. M.....Bellaire, Md.
Fulton, J. A.....Dover, Del.
Fuller, A. M.....Meadville, Pa.
Furnas, R. W.....Brownville, Neb.
Fisher, S. D.....Springfield, Ill.

Graves, J. F.....Danbury, O.
Garland, A. H.....Little Rock, Ark.
Galt, T. A.....Sterling, Ill.
Gale Mfg. Co.....Albion, Mich.
Gardner, L. D.....Hastings, Mich.
Gatchell, A.....Quincy, Ill.
Glass, P. T.....Ripley, Tenn.
Gentry, Wm.....Sedalia, Mo.
Grinnell, J. B.....Grinnell, Ia.
Gilbert, B. D.....Utica, N. Y.
Gridley, E.....Half Day, Ill.
Grinnell, J. S.....Greenfield, Mass.
Gordon, W. J.....Cleveland, O.
Goodale, S. L.....Saco, Me.
Goessman, C. A.....Amherst, Mass.
Gardner, E. H.....
Gillett, J. S.....Elkhart, Ill.

Hadmen, O. B.....Worcester, Mass.
Haines, J. S.....Germantown, Pa.
Hayes, M.....Dover, Del.
Harrington, H.....Keeler's Bay, Vt.
Hazard, R.....Peacedale, R. I.
Hazard, I.....New York City
Hazen, C.....Ladoga, Wis.
Harris, T. D., Jr.....Nashville, Tenn.
Hall, H. T.....Clear Lake, Minn.
Hazard, W. P.....West Chester, Pa.
Hazard, Edward L.....Wakefield, R. I.
Hammond, Geo.....Middlebury, Vt.
Hazard, W. A.....New York.
Havens, J. M.....Rutland, Vt.
Hayden, J. C.....Fort Reid, Fla.
Heath, A. S.....New York City.
Henry, T. C.....Abilene, Kan.
Heide, E. H.....Appleton, N. C.
Hegewich, A.....New York City.
Henderson, J. T.....Georgia
Hexemer, F. A.....New Castle, N. Y.
Holt, T. M.....Haw River, N. C.
Holtze, P.....New York City.
Holloway, T. W.....Pomaria, S. C.
Holmdale, C.....Marshalltown, Ia.
Hoskinson, J. P.....Healdville, Vt.
Hoskinson, W. B.....Healdville, Vt.
Hubbard, J. M.....Middletown, Ct.
Humphrey, M.....Concord, N. H.
Hurlbut, H. B.....Cleveland, O.
Hubbard, H.....Stockton, Cal.
Hudson, E. M.....New Orleans, La.
Hulick, Wm. H.....Easton, Pa.
Hunter, A. D.....Kerrville, Tenn.
*Hyde, Alex.....Lee, Mass.
Hyde, N. C.....Poultney, Vt.
Hyde, E. H.....Stafford, Ct.

Jackson, Geo.....Indianapolis, Ind.
Jennings, C.....Hortonville, Vt.
Jones, J. M.....Galveston, Tex.
Jones, W. B.....Birdsville, Ga.
Johnson, J. E.....St. George, Utah.
Jones, J. A.....Richmond, Va.
Jones, W.....Athens, Ga.

Kalb, G. O.....St. Louis, Mo.
Kennedy, A. L.....Philadelphia, Pa.
Keith, J. Y.....Jackson, Tenn.
Kennedy, T. S.....Louisville, Ky.
Kenerson, J. A.....Barnett, Vt.
King, W. S.....Minneapolis, Minn.
King, J. F.....New Orleans, La.
Kinney, T. T.....Newark, N. J.

Lawford, T. W.....Baltimore, Md.
Lawrence, M. J.....Cleveland, O.
Lawrence, Geo., Jr.....Wakesha, Wis.
Lapham, E. H.....Pittston, Me.
Lane, I. N.....West Newbury, Mass.
Lewis, E. P. C.....Hoboken, N. J.
Ledoux, L. P.....New York.
Ledoux, A. R.....New York.
Leighton, G. B. F.....Norfolk, Va.
Lester, J. E.....Johnston, R. I.
Loring, G. B.....Salem, Mass.
Locke, M. F.....Alma, Kan.
Lorentzen, J.....Monticello, Ia.
Lobdel, G. G.....Wilmington, Del.
Lynn, A. O.....Waco, Tex.
Landreth, Oliver.....21 S. 6th St, Philadelphia
Landreth, Burnet.....Bristol, Pa.

McLaren, H. M.....New York City

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McCarty, E. R.....New York City.
McLean, D. B.....Simsbury, Ct.
Malone, B. H.....New York
Mills, C. W.....Pompton, N. J.
McKean, T. L.....Easton, Pa.
McPherson, Wm. J.....Boston, Mass.
McIntyre, E.....Seward, Neb.
McComb, H. S.....Wilmington, Del.
McDonald, J. H.....Tipton, Ia.
McDowell, Jno.....Washington, Pa.
Mabry, C. W.....La Grange, Ga.
Manley, J. H.....Augusta, Me.
Mathews, C.....Clinton, Ind.
Macey, D.....Indianapolis, Ind.
Mason, E. D.....Richmond, Vt.
Mead, J. B.....Randolph, Vt.
Merryman, John.....Baltimore, Md.
Meem, G. S.....Mount Jackson, Va.
Mercier, L.....New York City.
Miles, Manly.....Mountainville. N. Y.
Malone, Berd. H.....Harlem, New York City.
Mills, D. O.....San Francisco, Cal.
Miller, H. K.....New York City.
Miller, G. S.....Peterboro, N. Y.
Minkler, S. G.....Oswego, Ill.
Mills, L. A.....Middlefield, Ct.
Miller, T. L.....Beecher, Ill.
Milk, L.....Chebanse, Ill.
Miller, W. R.....Little Rock, Ark.
Morris, J. C.....Friendsville, Pa.
Monecado, F. M. de.....Yecla, Spain.
Mozley, F. W.....Poultney, Vt.
Moran, P., & Co.....Chicago, Ill.
Montgomery, C. W., Jr.....Newark, Ohio.
Murphy, P. H.....Springfield, O.
Murray, W. K.....Flushing, N. Y.
Mudge, W L.....Binghamton, N. Y.
Menier, Leon.....New York City
Moulton, F. D.....New York City

Nathurst, E. O.....Tracy City, Tenn.
Neilson, Jas.....New Brunswick, N. J.
Needham, Danl.....Boston, Mass.
Newhall, J. C.....Conway, Mass.
Noyes, Geo.....Boston, Mass.
Nobles, S. C.....St. Albans, Vt.
Nuckalls, N.....Cayneos, Cal.
Nungesson, H.....New York City.

Owen, C. H.....Buckland, Ct.
Ochme, A.....Brainerd, Neb.

Parcell, N. W.....Elizabeth, N. J.
Parker, W. H.....Md. Ag. Col., Md.
Page, C. S.....Earlville, N. Y.
Patterson, T. J.....Level, O.
Page, J. B.....Rutland, Vt.
Partridge, B. F.....Bay City, Mich.
Patton, W. H.....New York City.
Perkins, H. B.....Fort Washington, N. Y.
Pearce, E. D.....Providence, R. I.
Peffer, G. P.....Pewaukee, Wis.
Pierce, T. W.....Topsfield, Mass.
Phinney, S. B.....Barnstable, Mass.
Pittman, J. S.....Providence, R. I.

Price, T. D.....Hannibal, Mo.
Pope, L. L.....Chagrin Falls, O.
Powell, E. R.....Augusta, Kan.

Rasin, R. W. L.....Baltimore, Md.
Randall, D.....New Brunswick, N. J.
Reall, Jos. H.....Harlem, N. Y.
Redfield, F. B.....Batavia, N. Y.
Riley, C. V.....Washington, D. C.
Richardson, E. M.....Mississippi
Ridgeley, H. M.....Dover, Del.
Ricker, E.....Frederickstown, Va.
Ross, L. F.....Avon, Ill.
Root, H. G.....Bennington, Vt.
Robinson, D. G.....Hastings, Mich.
Roots, B. G.....Tamaroa, Ill.
Root, F. P.....Brockport, N. Y.
Roberts, I. P.....Ithaca, N. Y.
Rutherford, J. B.....Harrisburg, Pa.
Rue, N. S.....Cream Ridge, N. J.
Ryerson, Abrm.....Hastings, Mich.

Sprague, N. T.....Brandon. Vt.
Swallow, Geo. C.....Columbia, Mo.
Slade, E.....Somerset, Mass.
Shaffer, J. R.....Fairfield, Ia.
Salisbury, J. H.....Cleveland, O.
Shattuck, J. S.....Norwich, N. Y.
Stevens, J.....Kenton, O.
Sedgewick, H.....Cornwall Hollow, Ct.
Seiler, D. W.....Harrisburg, Pa.
Stewart, Prof. E. W.....Lake View, N. Y.
Shethar, Saml.....New York City.
Snevely, Dr. J.....Neosho, Mo.
Steele, Geo.....San Luis Obispo, Cal.
Stearns, M. S.....New York City.
Stevens, G. H.....Malone, N. Y.
Seymour, Horatio.....Utica, N. Y.
Sneath, R. G.....San Francisco, Cal.
Smith, E.....Lee, Mass.
Simpson, G. W.....Boston, Mass.
Smith, Arro.....Deadwood, Dak.
Stillwell, C. M.....New York City.
Shinn, Chas. H.....San Francisco, Cal.
Smith, E. H.....Dubuque, Ia.
Scoville, J. V. H.....Paris, N. Y.
Stoddard, M. O.....Poultney, Vt.
Scott, Jno.....Nevada, Ia.
Scott, Wm.....Smithville, Va.
Snow, A. L.....Tazewell, Tenn.
Scott, R. W.....Fort Reid, Fla.
Stuyvesant, J. R.....Madison, N. M.
Smyth, Fred. K.....Manchester, N. H.
Smith, J. T.....
*Shipman, W.....
Simmons, Chas. E.....Chicago
Sutherland, Robt.....Bangall, N. Y.

Taggart, D.....Northumberland, Pa.
Taylor, E. W.....Houston, Tex.
Talbot, D. H.....Sioux City, Ia.
Talcott, L. H.....Williston, Vt.
Tenbroeck, R.....New York City.
Tichnor, I. T.....Auburn, Ala.
Thompson, C. W.....Wells, Minn.

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Townshend, N. S ... .Columbus, O.
*Torbert, A. T. A..... Milford, Del.
Thomas, S.....Montpelier, Vt
Thompson, G. W.....Stelton, N. J.
Trowbridge, G. W.....Glendale, O.
Toombs, Robert.....Washington, Ga.
Turner, J. C.....Chadd's Ford, Pa.

Underwood, N. F.....Lake Como, Pa.

Valentine, Lawson..... New York City.
Vail, H. W.....North Pomfret, Vt.

Watson, B. R.....Galt, Ill.
Warder, J. A.....North Bend, O.
Warder, J. T .....Springfield, O.
Warder, B. H.....Springfield, O.
Weed, H. N.....Stamford, Ct.
Weltz, Leo.....Wilmington, O.
Wheeler, D. H..... .....Plattesmouth, Neb.
Wells, S. M..... .....Weathersfield, Ct.
Whitman, Ezra.....Baltimore, Md.
Whitaker, Thos.....Needham, Mass.
Willis, B. T..... ....Belfast, N. Y.
Williams, Geo. L..... Buffalo, N. Y.
Wildman, H .....Langhorne, Pa.
Watson, E. M.....Jersey City, N. J.
White, W. M..... Canaseraga, N. Y.
Willard, X. A.....Little Falls, N. Y.
Whitehead, M..... Cincinnati, O.
White, G. E.....New York City.
Wiselogel, F. G.....Indianapolis, Ind.
Wilder, J. B.....Louisville, Ky.
Whitney, G. W.....Williston, Vt.
Winslow, C. M.....Brandon, Vt.
Williamson, W..... .....Ravenna, O.
Woodmansee, J. E.....Lake Como, Pa.
Wood, J. L.....Madison, O.
Wood, J. W.....Baraboo, Wis
Woodward, A. M.....Midland, Ill.
Wylly, G. W.....Fort Reid, Fla.
Wilson, J. B.....
Wilson, Wm. W.....

Young, Jas .....Middletown, Pa.
Young, H. H.....St. Paul, Minn.

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TRICHINOSIS.*)

On the strength of a report issued in December last by Mr. George Crump, acting British Consul at Philadelphia, much excitement has arisen over the pork product of the United States. This Association has made an extended investigation of the subject in the interests of American producers and finds there is no occasion whatever for the scare.

By a careful reading of Mr. Crump's report, which created the alarm, it will be seen that there is no foundation for any excitement. Mr. Crump speaks of Hog Cholera, not of Trichinosis, as the prevalent disease. That the former exists and has existed to an extent most injurious to producers, it would be folly to deny, but it has not affected the pork product, for the reason that animals dying from this or any other disease, are not and cannot be marketed for food. From Cholera the farmer and the farmer only is the sufferer.

Instead of denying the existence of cholera amongst hogs, means should be employed to obtain a cure for it, and it would be well for the government to aid in the extinction of this and other diseases of animals. A commission having a thoroughly practical man at its head, could undoubtedly produce satisfactory results. A few thousand dollars could be very wisely and beneficially spent by the government in this matter.

Trichinosis exists but to a more limited extent probably than any disease known to man. It is believed never to injure the hog, and scientific experts unite in the statement that it never can enter the human system except through insufficiently cooked meat, in which it should happen to exist. These are the simple facts with regard to it. As to the danger from the use of American pork products either by home or foreign consumers, there is absolutely none, first, from an almost total absence of Trichinosis; second, through protection by cooking. The curers of provisions in the United States are amongst the most honorable, pains taking, skilled merchants and manufacturers, whose interest is in putting up only the best and purest products. The pains they take, and the methods they practice, is a guarantee against danger.

A good deal of bad temper without reason has been shown in the discussion of this matter, and as already suggested it has been on false premises. It would have been judicious to have first ascertained just what Mr. Crump said, and since there have been frauds committed in our products, it was hardly fair to blame him for exposing them. On the contrary it would be more useful to endeavor to exterminate them. Careful investigation shows that Mr. Crump had no intention of being unfair. He was zealous in the aim to protect his people from impure and unhealthy food. It would be well if our officials would show as much zeal in this direction.

Suine or lard butter and Anti-Huff cheese are referred to by Mr. Crump. The former is a fraud and swindle that deserves the severest condemnation, but it cannot be dangerous to health, as lard can only be rendered at a temperature that will kill animalculæ. Oleomargarine is as iniquitous a compound as suine. Against the manufacture and sale of both there should be prohibitory laws, because of the injury they have done to producers and consumers of natural butter. They have been a curse to the country and its farmers. Anti-Huff cheese is an article of cheese made from milk, from which all the cream has been taken, and in place of which a small percentage of lard is incorporated. Sold under its proper name it need cause no prejudice against American cheese. Only two small factories are yet in existence and none in the West, as Mr. Crump has been led to believe. It is proper to observe that none of these adulterations are chargeable to the farmer. He is interested in preserving the

*) This article and accompanying matter was issued as the first special Bulletin of the Association.

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character and reputation of his products. The adulterations have been introduced and are manufactured solely by speculators, who are regardless of the country's prosperity, when it conflicts with their interests.

Every attention should be given to the matter of keeping our food products pure and beyond suspicion. On this our future prosperity as a nation hinges, for if we loose our export trade in produce, we may close our doors and vacate our farms.

NEW YORK PRODUCE EXCHANGE.

NEW YORK, March 15, 1881.

MR. J. H. REALL, *Sec'y*, 127 *Water Street, City:*

My Dear Sir:—Your note of the 12th inst. received. The Agricultural Department has not yet made its usual annual report of the number of hogs in the United States on January 1st, 1881. The number on January 1st, 1880, was 34,034,100,
" " " 1st, 1879, " 34,766,200,
" " " 1st, 1878, " 32,262,500,

The exports from all United States Ports to all foreign countries for the years ended December 31st, have been in

	1880	1879	1878
Pork, lbs.	98,983,543	91,802,988	83,743,710
Bacon, "	818,136,440	749,305,463	695,617,067
Lard, "	414,881,826	341,226,532	358,749,127
Total,	1,332,001,879	1,182,404.938	1,138,109,904
Value, $			
Pork,	6,992,979	5,360,310	5,055,573
Bacon,	60,681,792	48,434,513	54,827,455
Lard,	33,622,057	23,823,297	28,476,225
Total value,	$101,296,828	$77,618,120	$88,359,256

Respectfully Yours,

E. H. WALKER, Statistician.

S. H. GRANT, Superintendent.

Extract from a despatch from Mr. CRUMP, Acting British Consul at Philadelphia, to Earl GRANVILLE, dated December 21, 1880.

"From a sanitary point of view it may not be impertinent to call your Lordship's attention to the immense mortality among swine by a disease known as "Hog Cholera," of which about 700,000 head have died this year in Illinois. Immense quantities of pork are annually shipped to the United Kingdom, and as the disease "trichina spiralis" seems to be on the increase in this country the subject is not unworthy of attention. Two persons recently died in Milwaukee and one in Chicago. In the latter city several people are ill with it at the present time, and one entire family, attacked about a month ago, are not yet out of danger. A case just reported from Kansas, describes the symptoms of the disease, when it attacks the human family. In this case the victim is a farmer. He had been ill for some time and became much reduced in flesh. Upon consulting a physician trichinæ were found, worms were in his flesh by the millions, being scraped and squeezed from the pores of the skin. They are felt creeping through his flesh and are literally eating up his substance. The disease is thought to have been contracted by eating sausages.

"*Trichina spiralis* may be conveyed to human beings, it is thought, by gross adulterations used in the manufacture of butter and cheese, of which there is some exportation to England. The former is adulterated with lard and grease, which, in many cases, are taken from the places where hogs die of diseases, and then rendered into grease, glue, etc., and the latter by a commodity called 'anti-huff'."

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The following letters from the largest and most successful Pork Packers in the United States, who together put up ninety per cent of the Provisions, exported from this country, are a complete answer :

INDIANAPOLIS, IND., March 2d, 1881.

J. H. REALL, ESQ., *Sec'y American Agricultural Ass'n :*

Dear Sir :—Your favor concerning "Trichinosis" is received. We kill 200,000 hogs per year. We have never heard of anyone being injured by eating the Ferguson brand of meats. Possibly one hog in several thousand may be diseased in some way.

We regard the sensation as humbug. Probably rotten meat has killed some who ate it. It ought to have done so. We know of no way a Packer can detect trichinosis in a hog, and we imagine that very little is seen in human beings, save by doctors who need advertising.

Yours very truly,

J. C. FERGUSON & CO.

INDIANAPOLIS, IND., March 2d, 1881.

J. H. REALL, ESQ., *Sec'y American Agricultural Ass'n, New York :*

Dear Sir :—Your favor of 25th ult., received to-day. We know nothing whatever about the disease amongst swine called "Trichinosis." We have for many years known that a disease called by this name was at times prevalent in Germany, caused by eating uncooked pork or sausage, but the instances of like disease either in this country or Great Britain, ascribed to pork consumption, either cooked or uncooked, have been so rare, the trade has not taken any notice of it. We have never heard of hogs being diseased by "Trichinosis" or dying from its effects.

Our average yearly packing is about 450,000 hogs, and our average shipments to Great Britain of Hams and Bacon about two thousand boxes weekly. Our live hogs are carefully selected when purchasing at our stockyards or elsewhere, and all that can be detected showing signs of sickness are rejected, seller disposing of such rejection elsewhere. Pens in which sick hogs are numerous, we decline to buy at any price. Our brand stands amongst the highest in Great Britain, and we have never heard a complaint from any of our customers of our meats being diseased or carrying germs of disease to the consumer. The greatest possible care is taken after meats are cured, to have them thoroughly inspected before packing for shipment abroad, and as further precaution we employ independent inspectors to examine samples of all our meats at port of shipment.

We are of course aware of the recent prohibition order of the French government and its prejudicial effects on the trade in this country, causing at once a large shrinkage in value, and lately hurting the demand everywhere. We are, however, satisfied, the English government, though they may take some precaution to protect their subjects from disease by unsound importations, will never take the matter in hand in so arbitrary a manner as that adopted by the French authorities.

Yours truly,

KINGAN & CO., (Limited.)

KANSAS CITY, MO., March 3d, 1881.

J. H. REALL, ESQ., *Sec'y American Agricultural Ass'n, New York :*

Dear Sir :—Replying to yours of 28th ult., in regard to our facilities for discovering the disease among swine, known as "Trichinosis," we beg to say we have never seen any cases among swine in this section of the country, and have never had occasion to make rigid examination. In our opinion, the reports published in regard to the prevalence of the disease, have been largely exaggerated, and upon further examination, will prove that there is not as much Trichina as has been reported.

Yours truly,

PLANKINTON & ARMOUR.

MILWAUKEE, March 3d, 1881.

MR. J. H. REALL, *Sec'y, New York :*

Dear Sir :—Your favor of the 28th ult. duly at hand, and noted in reply to your question as to the dangers in using the flesh of swine, would say with all candor, that we do not feel there is any, or any cause for alarm. We do not think there are as many deaths caused by "Trichine," as by the use of Tobacco from "Nicotine." We slaughter from five hundred to as many thousands swine per day, according to arrivals, season of year, &c. We use all ordinary care in the inspection of these animals, and reject all that are unfit for use, having people in our employ, who are experts in their way, and know by the appearance of the flesh

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as well as by the sense of smell, which are sound or unsound. Now, as for the grounds for the late reports which have been made, would say there is none, and then, that they have in a large degree originated in the brains of some of our intrepid speculators, for aims and purposes best known to themselves, and which we will not attempt to fathom- We know that the world has used a large amount of American provisions and that they must continue to do so. We will be pleased to have the results of your investigations.

Yours truly,

PLANKINTON & ARMOUR.

CHICAGO, March 5th, 1881.

MR. J. H. REALL, *Sec'y American Agricultural Ass'n, New York*:

Dear Sir:—Your communication of the 28th ult. duly received. We have no information of any value to impart in regard to Trichinosis. We slaughtered during the past winter some three hundred and sixty thousand (360,000) hogs, which were, with few exceptions, good, sound, healthy hogs. The exceptions were a few sick ones, which are occasionally found among large droves, and they are never cut up into meats, but put into grease. While we do not make any microscopic examinations of our meats, we use the utmost caution in not packing any but healthy hogs, and have yet to hear of the first instance of Trichinosis being discovered in our meats. We are using Pork daily on our table *and feel perfectly safe*. We do not take any stock in the present hue and cry on this question, and it appears to us, that it will prove more of a speculative dodge than any real danger.

Very Respectfully,

IRA S. YOUNGLOVE, Pres.,
CHICAGO PACKING & PROVISION CO.

OFFICE OF WILLARD, PARKER & CO., Pork Packers.

DETROIT, MICH., March 19th, 1881.

Dear Sir:—There is no talk of trichina among the hogs in our section, nor have we ever known of any. We do not think the hogs in the whole West were ever more free from diseases of all kinds than for the past year. We believe that hog meats are always safe as an article of food when *cooked*, trichina or no trichina. Of the few deaths that are supposed to have occurred during the last 15 or 20 years in this country from the use of hog meat, we *think* all or nearly all have been shown to have occurred among those, who from custom eat the meat without cooking. We know of nothing in the mode of rearing and feeding the hogs that should cause this disease to be more prevalent one year than another.

Yours truly,

WILLARD, PARKER & CO.

DES MOINES IOWA, March 21st, 1881.

MR. J. H. REALL, 127 *Water Street, New York*:

Dear Sir:—I am in receipt of your favor dated 14th, requesting me to give you all the information I can regarding swine diseases, more especially that termed "Trichinosis." It would afford me great pleasure to be able to furnish you any information on the subject, but I must confess I know nothing whatever about it, and the term and disease alluded to, were never heard of here until the papers gave publicity to same. Whether you give us credit for ignorance on the subject, or the hog in this district entire immunity from the disease, rests with yourself, but it is nevertheless a fact that nobody here knows anything about it. If a hog is sick and dies, it is put down to cholera. We are in a very good hog-growing country, and usually our hogs are very fine, and we seldom hear of any disease among them. I would like to give you some information, but it is a thing we know nothing of here, nor have I ever heard of anyone being attacked with Trichina in this section of country.

Yours truly,

W. S. ELLSWORTH.

KANSAS CITY, March 18th, 1881.

J. H. REALL, ESQ., *Sec'y, etc., American Agricultural Ass'n*, 127 *Water Street, New York*:

Dear Sir;—Replying to your favor of 14th inst., will say that during the past twelve months we have not met with any cases of "Trichinosis" in the hogs handled by us.

Very truly yours,

ANGLO-AMERICAN P. & P. CO.

BOSTON, March 3d, 1881.

J. H. REALL, ESQ., *Sec'y, American Agricultural Ass., New York*:

Dear Sir:—In reply to your favor of the 28th ult., inquiring as to the number of hogs killed by us, the pains taken to detect unhealthy meat and our facilities for detecting it, we would say—we killed 415,864 hogs last year and found but very little disease of any kind amongst them.

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Every hog, after being killed and dressed, is carefully examined by competent and experienced men, and any animal, not perfectly healthy and sound, is passed to the Grease Tanks.

As to our facilities for detecting unhealthy meat, we consider our foremen to be the most competent judges, from their continual inspection and examination of the animal and its product.

A few irresponsible packers may have shipped irregular goods—below standard and half cured or green—which have spoiled on the passage to Europe, and thus given just cause for unfavorable comment, but in view of the enormous consumption of the Hog Product, both at home and abroad, and the absence of any authenticated cases resulting fatally from the use of Standard Goods, we are not disposed to believe any considerable number of American Swine to be affected with "Trichinosis."

Any information or aid which is in our power to extend to you, is freely offered and we shall always consider it a pleasure to respond to your inquiries.

Yours, Very Truly,

JOHN P. SQUIRE & CO.

CLEVELAND, O., March 7th, 1881.

J. H. REALL, ESQ., *Sec'y*, 127 *Water St.*, *New York:*

Dear Sir:—In reply to your favor of February 28th, would say, we slaughter about 430,000 hogs annually. We have never heard of a case of Trichinosis in any meats we have ever handled. About two-thirds of our product goes to England, the other third is sold in this city and surrounding country.

Our instructions to our buyers are, to buy only choice smooth hogs, and reject all that show any signs of injury in transit. On arrival at our Slaughter House, if a hog shows bruises, or any condition but perfect health, we invariably put them into the Tanks to be rendered into grease.

We know of no disease of any kind among hogs, in this part of the country, and have no doubt that all the meat we have packed, has been entirely free from any unhealthy condition.

We believe the other Packers in this city and vicinity take the same pains to procure wholesome meats that we do.

The principal managers of this company have been in same business about thirty years, in this city, and have never known or heard of even a suspicion, that any case of Trichinosis has ever resulted from any meats they have sold.

Yours Respectfully,

CHARLES C. HILLS, Sec'y.
CLEVELAND PROVISION CO.

CEDAR RAPIDS, IOWA, March 8th, 1881.

J. H. REALL, ESQ., *Sec'y*, *American Agricultural Ass.*, *New York:*

Dear Sir:—We have yours of 28th ult., asking for information with reference to the swine disease, known as "Trichinosis." We know very little of it here practically. We understand that in this whole section of country there has only been one well authenticated case, and that was some time before this firm was established here. The writer has lately talked with one of our most prominent scientists in this state. He states, what has indeed been well known for some time, that there is no danger from Trichina if the meat is properly cooked. There is no poison about Trichina. It is only when the meat is eaten raw, as it frequently is by the French and Germans, that there is any reason to fear injurious consequences. The Trichina is encased in a small cell which is dissolved by the digestive organs, and the insect thus set free lays an infinite number of eggs which find their way into the blood and thus cause death. From all we can gather there is no reason to alarm people upon this point if they will only refrain from eating the meat raw. We have killed during the past year, 402,229 hogs, Every piece of meat is carefully tried by a competent trier, after it is cured, before being sent out to the buyers.

Hoping the above information will be of service, we remain,

Yours Truly,

T. M. SINCLAIR & CO.

SIOUX CITY, IOWA, March 12th, 1881.

J. H. REALL, ESQ., 127 *Water St.*, *New York:*

Dear Sir:—Yours of 28th February at hand, hogs in this section of the country are healthy, no cholera or any other disease among them, we have killed about 50,000 in the last four months.

Yours Truly,

JAS. E. BOOGE & CO.

Hogs have never been so healthy here as the last two years.

J. E. B. & CO.

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LOUISVILLE, KY., March 16th, 1881,

MR. J. H. REALL, *Sec'y, New York:*

Dear Sir:—We have yours of the 14th, and in response we inclose the sense of our Board of Trade embodied in a resolution on the subject about which you inquire. This city receives from the state of Kentucky, Tennessee and Indiana 850,000 head of Hogs annually, of which number about 235,000 head are cut and cured, by the Pork Packers, annually mostly for southern states' consumption. The stock of Hogs fed in this section is principally Black Berkshire, a very fine high bred breed of Swine, and is almost entirely corn fed, which gives firm good meat. It is the opinion of well posted men about here that there is less disease this, than any previous year, for a period of 10 years, and what there is mostly among very young Hogs. We regard it as a mere bagatelle, an incident only, and a thing attendant upon all animal nature more or less. Such a thing as Trichinosis in the human body is wholly unknown, so far as our knowledge goes, and is regarded here as a matter for broad smiles instead of apprehension.

The idea prevails here that these reports originated on the Chicago Board of Trade, among a lot of Hebrew brokers who were too heavily caught on the short side of the deal.

If we can be of use to you further we will be pleased to respond to any of your questions.

Respectfully Yours.

HUGHES, TAGGART & CO.

LOUISVILLE BOARD OF TRADE.

LOUISVILLE, KY., March 16th, 1881.

At a meeting of the Board of Trade held on the 7th day of March, 1881, the following was adopted.

Whereas, we learn that reports are circulating in the European markets about disease in the hogs and Trichina in meats exported from this country to Europe, and, whereas these reports are false and ridiculous and seriously injurious to those engaged in these food products, which are cheap, wholesome and necessary to the well being of mankind; and, whereas, it is known to us that the hogs in the state of Kentucky and Tennessee are unusually healthy and free from disease.

Therefore, resolved, that it is the judgment of the Louisville Board of Trade, that there are no grounds for these reports whatever, and, therefore, no cause for apprehension in the minds of foreign consumers of hog meats if properly cured, and thoroughly cooked, and that all meats prepared in this market for foreign and domestic consumption are carefully and honestly cured, and Trichinosis in the Southern States of America, where hog meats are more largely used than in any other country, is a disease absolutely unknown.

(From the Minutes.)

S. M. WRIGHT, Sup't.

CHICAGO, March 17th, 1881.

J. H. REALL, ESQ., *Sec'y, American Agricultural Ass., New York:*

Dear Sir:—Your favor, 16th, received and noted. We were intending to advise you, that in the absence of any information of value, we thought best to allow this discussion to drop rather than to keep it alive by denial or argument.

As there has not at any time, in this country, been sufficient annoyance from Trichina to warrant even general public attention, to say nothing of your action, we have nothing of statistical value to offer.

We feel that prohibitory orders and decrees, or any government interference with trade, other than that demanded upon purely sanitary grounds, will work its own cure by reputation of the untrustworthy data upon which they are based, by those interested in the countries made the victims of such imbecile action.

Yours Truly,

ARMOUR & CO.

OTTUMWA, Io., March 18th, 1881.

MR. J. H. REALL, *Sec'y American Agricultural Ass.*, 127 *Water, New New York:*

Dear Sir:—We are in receipt of your favor of the 28th ult. During the twelve months just past we killed 130,000 hogs, and have to report that the health of same have been uniformly very good. They have been unusually free from disease.

We believe the reports that have been circulated have generally been without foundation.

Yours Truly,

JOHN MORREL & CO., L't'd,

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NEW HAVEN, CONN., March 17th, 1881.

MR. J. H. REALL,

Dear Sir:—Yours of the 12th, at hand, and we very cheerfully give you what information we can, connected with the provision business of the United States, although we are not as largely engaged as men of the large Western Houses, and perhaps not able to give you any new facts, being located in New England so far away from the great hog producing districts, and consequently, do not come into as close contact with the feeders and producers as some others. The writer has been connected very closely and actively with the producers and consumers, for almost forty years, and has witnessed the growth of the provision business from almost nothing to its present great, grand proportions. The packing and provision business occupies no unimportant position, affecting very materially as it does, the finances of the country, and all other interests must be closely and directly concerned in the prosperity and growth of this one. We trust that the government and all the leading enterprises of the country, both financial and industrial, will see that no damage comes to so important a factor in the commercial success of the nation.

We will, as clearly as we can, give you the substance of our experience and observations on this important topic. We have slaughtered, cut and cured during the year, ending September 1st, 1880, 195,000 hogs, at New Haven, and from the last six months, ending with March 1st, 1881, something over 100,000 head and we have never seen the hogs so healthy and coming in better condition, when we take into consideration that all of them were transported more than 1,000 miles, by rail. It is well known that when live stock of any kind is transported, if there is any disease existing among them it quickly developes and spreads. We can safely say, that we have had no disease whatever in the stock, coming into our hands. We do not pretend that there is not at all times, and in all places a very large number in the aggregate of the young hogs, that die before they come to maturity, from various causes, principally from the want of proper care, and good food and water. There will always be, in every country, those, who do not give the care and the attention to their stock that their own interests demand, as well as their feelings of humanity. Hence come disease, weak stock, and more or less death. These facts are not confined to stock alone, but embrace all of the domestic brute creation. There is a large percentage of death and disease in all domestic animals, and if they could know its extent it would no doubt astonish the consumers. For instance take the loss by disease to the producers of poultry, there is no doubt but that a larger percentage of disease and death can be found there than in any one article of animal food that is used by the human family, and yet how few there are who have ever given this subject any thought. New England is and always has been a large consumer of hog product. Every household had its own pork barrel, and if that was empty before killing time it was considered a serious matter. Who does not know, that knows anything about New England life, that pork was used almost daily, year in and year out, in every home throughout that section. You cannot find a more healthy or vigorous population any where. We have never known, as far as our means of knowing extend, of one single person having died from eating pork, in New England. Can the same be said of any other article of food that has been used to the same extent that this has been? Some cases of Trichinosis were reported in New York and the West, but in all instances pork had been used uncooked. There is much more that could be said upon the subject but I have no doubt but that you have had much abler and fuller correspondents. I should have replied earlier but have been delayed about it.

I remain, Yonrs Truly,

JED. SPERRY,
OF SPERRY & BARNES.

ST. JOSEPH, MO., March 22d, 1881.

MR. J. H. REALL, *Sec'y, New York:*

Dear Sir:—Your favor of the 16th inst., at hand, contents duly noted, in reply will say: our swine or hogs are healthy, and have not heard of any disease called the Trichinosis, nor did we discover any during our packing this winter. We have been packing over ten years and never found the hogs in better health. We heard of none dying of disease, only by being frozen to death, and we have been inquiring but cannot hear of any disease in the state, only by extreme cold weather, hogs overlaying. Hoping this be satisfactory, we remain,

Yours Respectfully,

HENRY KRUG PACKING CO.

NEW YORK, March 30th. 1881.

J. H. REALL, ESQ., *Sec'y, American Agricultural Ass.*, 127 *Water St.:*

Dear Sir:—In reply to your enquiry regarding Hog Cholera and Trichinosis, we beg to say, that, during the year ending March, 1880, we killed, in our packing houses, in the west,

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over one and a quarter million hogs, and that during the year ending this date we have killed about the same number. Our meats are chiefly cured and packed for the English trade, and we are very particular to buy only selected hogs as our customers must have only superior quality, by this means we have had to inspect a very large number of hogs in the course of our business, and the result of our experience is that hogs generally, this season, have been healthier than for some years past. By our careful selection of hogs it is impossible for any inflicted with disease to pass our inspection, and we have not yet seen any case of Hog Cholera or Trichinosis in our packing houses.

We consider the recent excitement on this subject, in Europe, entirely groundless, and chiefly caused, we believe, by absurd reports promulgated by parties who did not understand what they were writing about.

We have been in the packing business for many years and do a very extensive trade in hog products, and consider that we have had a better quality of meats and healthier hogs this year than any time since we have been in the trade.

Yours Truly,

FOWLER BROS.

NEW YORK, March 30th, 1881.

MR. J. H. REALL, *Sec'y American Agricultural Association, New York:*

Dear Sir:—I am glad to know that you have been in correspondence with the provision packers of the country and have become so well informed as to the magnitude of their business and the care with which it is conducted. I have, as you know, been absent from New York for nearly six months, and during that time I have visited every provision packing establishment of importance in the country, and have also travelled through the southern section of the country where the product of these great provision establishments is very largely consumed, and it gives me great satisfaction to confirm, from personal examination and enquiry, all that your correspondents have stated to you with reference to the care and skill with which the provisions of the country, for the home and export trade, are manufactured, and furthermore to say, that in the districts where the consumption of provisions is very large I did not hear of a single case of Trichinosis.

It would be hard to find a business conducted by men of higher character or more intelligence than the great provision packing business of the United States. Its magnitude and the system and care employed in every branch of it is surprising and gratifying, and cannot in the end, I am sure, when the facts of it are well understood, both at home and abroad, as they will be through the correspondence soon to be published in the journal of your association, be permanently injured by the unjust and unjustifiable reports that have been circulated to accomplish mercenary purposes.

The statements of such firms as Armour, Plankinton & Co., Cleveland Provision Co., Sperry & Barnes, J. P. Squire & Co., Kingan & Co., J. C. Ferguson & Co., Krug Packing Co., Fowler Bros., and T. M. Sinclair & Co., and others of like character, must necessarily be of great service, both here and abroad, to the great industry they represent, and your association is deserving of all praise for placing them before all who are interested in the manufacture and consumption of American provisions.

Very Truly Yours,

WILLIAM A. HAZARD,
Firm of FRANCIS D. MOULTON & Co.

NEW YORK, March 31st, 1881.

MR. J. H. REALL, *Sec'y*, 127 *Water Street:*

Dear Sir:—In answer to your inquiry, I have to say, that in about fifteen years experience as a packer of bacon and hams, both here and at western points, I have never known or heard of any properly authenticated discovery of Trichina Spiralis in hogs flesh, by those whose business it was to handle the meat, and a close observation of the newspaper reports, on the existence of Trichinosis in the human body, has failed to show me even one instance in which the person afflicted had not been indulging in the *luxury* of raw meat, in the shape of ham or beef, (commonly called bologna,) sausages, so that it seems to me to be pretty clearly demonstrated that if there be such parasites as Trichinae in beef, mutton, pork or other animal food, no danger can result from eating it, if it be only first properly cooked, as is the custom, not only here but in England.

ARCH'D BAXTER.

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FERTILIZER MAKERS' STOCK.

GEORGE E. WHITE,

DEALER IN

POTASH, NITROGENOUS MATTER, CRUDE, GROUND AND DISSOLVED,

Bone Phosphates, Bone Black, Fish Guano, Sulphuric Acid,

AND ALL MATERIAL USED BY THE MANUFACTURERS OF FERTILIZERS.

Also in Manufactured Goods, such as

"CLIMAX" Ammoniated Super-phosphate with Potash;
"DEFIANCE" Super-phosphate without Ammonia;
GROUND DRY FISH, yielding 8 to 10 per cent. Ammonia;
PURE GROUND BONES; GROUND FISH, with Potash;

—ALSO—

OIL CAKE MEAL for Cattle, Sheep and Horse Feed.

(Sample Bags of this, containing 100 pounds, forwarded to any address on receipt of $2.00.)

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159 FRONT STREET, NEW YORK.

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GARDEN, FLOWER AND FIELD SEEDS.

29 & 31 Fulton St., New York.

Bird Seeds, Prepared Food for Mocking Birds, Bird Fanciers' Supplies.

See Page Twenty

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OF

Choice Cattle, Horses, Sheep & Pigs.

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Extra Early, Very Dwarf (8 to 10 Inches), Requires no Bushing, Exquisite Flavor.

Acknowledged by all to be the best and earliest Pea grown.

Editor of American Agriculturist says: "Very early, productive and good; quality not to be surpassed."

CAUTION.—As there is another Pea in the market called "American Wonder," send to us and get the genuine Bliss' American Wonder. Observe our fac-simile on every package.

PRICES.—One-fourth pint package, 20 cents; pint, 65 cents; quart, $1.25; by mail, post-paid.

Our Novelty Sheet, giving full particulars, mailed free.

B. K. BLISS & SONS'

HAND BOOK for the FARM & GARDEN.

300 BEAUTIFUL ILLUSTRATIONS,

With a richly colored p' e of a Group of Pansies, and a descriptive priced list of 2,000 varieties of FLOWER and VEGETABLE seeds—with much useful information upon their culture—150 pages—mailed to all applicants enclosing 10 cents, which can be deducted from first order for seeds.

Address, B. K. BLISS & SONS, 34 Barclay Street, New York.

PRINGLE'S

New Hybridized Excelsior-Hulless Oats.

Mr. C. G. Pringle, the well-known successful hybridizer, to whose efforts we are indebted for the celebrated *Champlain and Defiance Wheats*, has been successful in imparting important improvements to another cereal. We have purchased the entire stock of this promising novelty, and now offer for the first time **Pringle's Hybridized Excelsior-Hulless Oats.**

With a view to impart to the hulless species the size of plant, vigorous habit, and productiveness of one or other of the favorite hulled sorts, Mr. Pringle, amongst other experiments, hybridized the well-known Excelsior Oats with the Chinese Hulless, and the experiment proved highly successful, the result being the variety now offered.

For further particulars see our Illustrated List of novelties, mailed free to all applicants.

Price: Packets containing one ounce, 25 cents; five packets for $1.00.

B. K. BLISS & SONS,
34 Barclay street, New York.

NEW POTATOES.

Extra Early Peach Blow.—A variety of great merit, as early as the Alpha, and somewhat like this favorite variety in appearance, of uniform size, very prolific and excellent cooking and keeping qualities. **White Star.**—Perfectly distinct, oblong, large and handsome tubers, medium early; as a table variety faultless. **Adirondack.**—The symmetrical form of this variety at once attracts attention; extremely productive, flesh pure white, floury and of excellent flavor; keeps well. Price of either of the above varieties by mail, 1 pound $1.00; 3 pounds, $2.50. **Queen of the Valley.**—A remarkable variety of enormous size and extraordinary productiveness; its vigorous habit enables it to resist disease. Cooks and keeps well. By mail 75 cents per lb.; 6 lbs. $2.00. **Late Beauty of Hebron.**—A handsome, oblong variety; a sprout of the original Beauty of Hebron; an abundant cropper; table properties of the highest order. **American Magnum Bonum**—Very early and productive; unusually large, resists disease well; when cooked floury and of a delicious flavor; an immense cropper. **Sutton's English Magnum Bonum.**—A late variety of great merit; very prolific and quality of first excellence. Price of each of the last three named varieties by mail 60 cts. per lb.; 3 lbs. $1.25. For description and further particulars send for our *Illustrated Sheet of Novelties* for 1881, mailed free to all.

Bliss's Illustrated Potato Catalogue.—Contains a list of 500 varieties Potatoes, embracing several new and very promising varieties, with explicit directions for culture, and much other valuable information respecting this valuable esculent. 10 cents. **B. K. BLISS, 34 Barclay St., New York.**

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IMPORTERS, MANUFACTURERS AND DEALERS IN

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STRICTLY PURE GROUND BONE

A SPECIALTY.

Our *COMPLETE MANURES*, specially compounded for each crop, are CHEAPER THAN STABLE MANURE, and show wonderful results.

☞ SEND FOR CIRCULARS. ☜

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21st Annual Statement of the

EQUITABLE

Life Assurance Society of the U. S.

HENRY B. HYDE, President.

For the Year ending December 31, 1880.

AMOUNT OF LEDGER ASSETS, JAN. 1, 1880	$35,980,997.62
INCOME	8,735,699.43
	$44,716,697.05

DISBURSEMENTS.

Paid Policy-Holders for Claims by Death, Dividends, Surrender Values, Discounted and Matured Endowment and Tontine Policies, and Annuities	$4,792,987.97
Other Disbursements as per detailed Statement	1,513,915.06
NET CASH ASSETS, December 31, 1880.	$38,409,844.02

ASSETS.

Bonds and Mortgages	$9,053,475.50
United States Stocks	2,513,591.00
State, City and other Stocks authorized by the Laws of the State	8,987,429.47
Loans secured by United States and other Stocks	7,064,562.88
Real Estate	8,368,363.62
Cash and other Ledger Assets as per extended Statement	2,422,428.55
	$38,409,844.02
Market value of Stocks over Cost	1,591,051.98
Accrued Interest, Rents, and Premiums, as per extended statement	1,177,707.02
Total Assets, Dec. 31, 1880	$41,108,602.32
TOTAL LIABILITIES, including legal reserve for reinsurance of all existing policies	31,880,308.11
Total Undivided Surplus	$9,228,294.21

Risks assumed in 1880, $35,170,805.00
Risks Outstanding $177 597 703.00

JAMES W. ALEXANDER, Vice-President.

SAMUEL BORROWE, 2d Vice-President.

E. W. SCOTT, Superintendent of Agencies.

NOTICE.

The Equitable Life Assurance Society having declared its policies, over three years in force, to be incontestable, announces that all such incontestable policies will be paid at maturity, without rebate of interest, immediately after the receipt at the Society's office in New York of satisfactory proofs of death, together with a valid and satisfactory discharge from the parties in interest, and without requiring any delay, even for sixty or ninety days, as has been the custom heretofore, and is still usual with other companies.

ASSETS, $41,000,000

SURPLUS, 9,000,000

THE

Mapes Complete Manures,

SPECIAL CROP MANURES.

Remarkably *large* and *profitable* crops grown during the past season, without stable manure and with ordinary field culture.—Season 1880.

CORN—68, 106, 125, 134 & 159 bushels Shelled Corn, per acre, on poor and ordinary lands. For full reports, cost per bushel, etc., see pamphlet pages...5, 6, 7

These unprecedented crops are established, beyond all doubt, by the testimony of many well-known farmers and agriculturists, including the following who have examined the crops during harvesting and have made reports on same.

Prof. A. R. LEDOUX, Director N. C. State Agri. Station. L. C. BENEDICT, Agri. Ed. N. Y. World (Weekly). Dr. WM. M. HABERSHAW, Chemist N. Y. State Agri. Society. HENRY STEWART, Agric. Ed. of the New York Times (Weekly). ROBERT J. DODGE, Pres. Farmers Club of the Am. Institute, N. Y. E. WILLIAMS, Secretary N. J. State Horticultural Society. Dr. F. M. HEXAMER, Ed. "Am. Garden." Mr. BRUGGERHOFF, of Thorburn & Co., N. Y.

See Extracts from the NEW YORK WORLD, NEW YORK TRIBUNE, NEW YORK TIMES, RURAL NEW YORKER, AMERICAN GARDEN, COMMERCIAL WORLD, etc., in pamphlet pages.....1 to 4

POTATOES—200, 300 and 400 bushels Potatoes per acre, see pamphlet pages.....9 to 11

SUGAR BEETS—37,600 lbs. per acre, see pamphlet page..... 32

The above crops were all grown exclusively with the Mapes Special Crop Manures.

Quick Action—Permanent Effects.

☞ SEND POSTAL FOR PAMPHLET.

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158 FRONT STREET,

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Full Assortment of Chemicals at Lowest Wholesale Rates.

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ILION, N. Y.

Manufacturers of a General Line of **Agricultural Implements, Plows, Cultivators, Horse Hoes, Mowers, Wheel Horse Rakes, Shovels, Hoes, Forks, &c., &c.**

Branch Offices—57 Reade Street, New York. 21 South Howard Street, Baltimore, Md.

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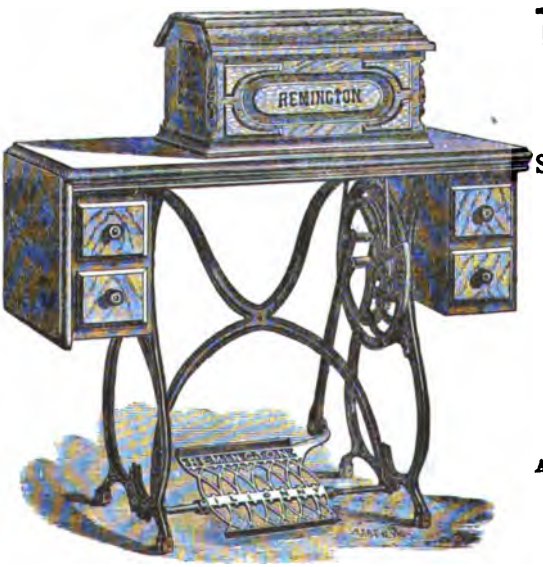
CARBON METAL, No. 12.

The "**NEW REMINGTON CLIPPER**" is the "latest thing out" in Plows. It is a decided practical improvement over every other. The most experienced Plow Maker in this country has been engaged upon it, and he has produced the "NEW REMINGTON" by combining the best points of other plows and carefully improving them. He has thus perfected a *Model Plow* which for all general purposes excels any Plow now in use.

Advantages of the Carbon Metal.—We are not only able to make the Carbon Plow LIGHTER than the Chilled Plow, but having no *warping* to overcome we can make the moldboard fit the standards without the use of *packing*, so that when a new moldboard is wanted the farmer will have no difficulty in putting it on in place of the old one. Every board fits the standard. Those who have had to replace moldboards for the Chilled Plow know what a disadvantage they labor under in this respect.

Every part of the Plow fits its place so perfectly that we can ship the Plows "knocked down," and the purchaser will have no trouble in putting them together.



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MANUFACTURERS OF

STAR BONE PHOSPHATE, STAR GUANO, PEACH TREE PHOSPHATES, SUGAR BEET PHOSPHATES, And GROUND BONE.

Importers and Dealers in NITRATE OF SODA, GERMAN POTASH SALTS, of all Grades, SULPHATE OF AMMONIA, and OIL OF VITRIOL.

Trade LONDON PURPLE. Mark.

The BEST INSECTICIDE ever used for the destruction of the *POTATO BUG, COTTON WORM,* and *CANKER WORM.*

Sold by all Wholesale Druggists and stores throughout the United States. If not obtainable of nearest dealer, send direct to sole Manufacturers,

HEMINGWAY'S LONDON PURPLE CO. (Limited),

60 Mark Lane, London, Eng. 90 Water St., New York—P. O. Box 990.

Prof. C. V. Riley says:—"It can be more effectually sprinkled or sprayed on the plant than Paris Green, by virtue of its greater fineness."

Prof. C. E. Bessey says:—"It quickly kills both Larvæ and the winged insect."

Prof. A. J. Cook says:—"With this cheap poison we have no longer reason to fear such enemies as the Canker Worm, etc."

A. R. Whitney, Franklin Grove, Lee Co., Ill., writes:—"We have bid the Canker Worm a long farewell, and have done it with your London Purple."

GEO. B. FORRESTER,

188 Pearl Street, New York,

—MANUFACTURER OF—

Forrester's Complete Manures

Prepared specially for each crop——The Correct System of Fertilization.——Dealer in

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SUPER-PHOSPHATE LIME. SULPHATE OF AMMONIA. NITRATE OF SODA. NITRATE OF POTASH. SULPHATE OF POTASH, 90 per cent. test. *SULPHATE OF POTASH,* 70 per cent. test. *SULPHATE OF POTASH,* 50 per cent. test. *MURIATE OF POTASH,* 80 to 84 per cent. test. *SULPHATE OF MAGNESIA. SULPHATE OF SODA.*

STRICTLY PURE GROUND BONE.

THE NEW YORK PLOW CO.,

55 Beekman Street,

ENSILAGE CUTTERS,

$50.00, $75.00, $100.00, $150.00.

Substantial, Durable, not liable to accidents, with Elevators, &c. Brown's Latest Facts about Ensilage with Gifford's Treatise, 30 cents. ☞ Special Correspondence with Farmers invited, concerning our

New Special Challenge Plow with Tool Steel Point,
" Smoothing Harrow, with Adjustable Tooth,
" Corn Planter and Fertilizer Distributor,
" Cheap Manure Spreader,
" Disk Pulverizing Harrow,
" Corn Sheller—Cornell, 1880,
" Hilling Cultivator, with Screw Blade.

All leading Agriculturists should deal directly with us and secure best goods of latest style at lowest prices. 800 different Plows, and Repairs for all Plows, &c.

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KILL The POTATO BUG and the COTTON WORM. SURE DEATH to the Potato Bug and Cotton Worm only to be had by the use of Paris Green. Prof. Cook and others say that all other remedies have failed. Endorsed by A. S. Fuller, Agricultural Editor of the "Sun." PURE PARIS GREEN, made by F. W. Devoe & Co., can be relied on for the extermination of the Potato Bug and Cotton Worm. Circular on the use of Paris Green distributed free on application.

F. W. DEVOE & CO'S MIXED PAINTS.

For the convenience and economy of consumers of PAINT the well known house of F. W. DEVOE & CO. now prepare Paints Ready for Use for Farmers and Manufacturers. They are uniform in shade, and the colors can always be matched. Any one can paint with them. No need of a painter to mix it for you. No need of a dryer or other ingredients. The paint is ready for immediate application. Send for sample cards showing different shades. They have very superior covering properties and do not, like the so-called patent paints, contain either water, benzine or alkali. These Paints are in Liquid Form, and are sold in Gallon Cans and Barrels. They are also put up in small cans of one to five pounds. If our brand of Paints are not kept on sale by your dealer, send direct to F. W. DEVOE & CO., Manufacturers and Importers of Colors, White Leads, Zinc White, Varnishes and Artists' Materials, Corner Fulton and William Streets (Old Dutch Church Corner), New York City.

B. & M. R. R. LANDS IN NEBRASKA.

LOW PRICES! EASY PAYMENTS!

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Burlington & Missouri River R. R. Co.

—IN NEBRASKA—

HAS FOR SALE

600,000 ACRES

OF THE CHOICEST FARMING LANDS IN THE WEST.

Which it offers on most favorable terms of payment to those in search of Homes and Cheap Farms. These lands are situated in the eastern half of the State, a region well supplied with Railroads, Bridges, Schools, Churches, etc., and which is being rapidly settled. The lands are chiefly undulating and rolling prairies, intersected by numerous streams of pure water, having wide valleys of rich bottom land. The country is well drained, and there are no swamps or other waste places. The climate is in every way desirable. No malaria; no epidemic diseases; and good health is enjoyed here to as great an extent as in any part of the world.

The soil is a RICH LOAM of the best quality, slightly mixed with sand, and is unsurpassed in fertility, and produces Wheat, Corn, Oats, Rye, Barley, and all other grains of the temperate zone, in greatest abundance, as well as fruits and vegetables.

This State is admirably adapted to Stock-growing in all its branches. Horses, Cattle, Hogs and Sheep are raised in great numbers, at small expense and large profits. No State possesses greater advantages and attractions for the successful prosecution of diversified farming. The area of cheap agricultural lands is rapidly diminishing, and Nebraska represents the western limit of the rich prairie lands of America, and offers great inducements to farmers and stock growers of the Eastern States to come and help develop her great resources. The lands of this Company are sold on

TWO, SIX AND TEN YEARS' CREDIT,

with small annual payments, and low rates of interest. Also for cash at large discounts. For full information apply to

J. D. McFARLAND,

Land Commissioner B. & M. R. R.,

LINCOLN, NEBRASKA.

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COOLEY CREAMER.

GOLD MEDAL—PARIS, 1879.

Butter made by this process awarded SWEEPSTAKES at International Dairy Fair, 1878—Gold Medal, same Fair, 1879, and Gold Medal at Royal Agricultural Exhibition, London, England, 1879.

Manufactured in Four Styles and Ten Sizes, to suit the wants of all.

THE REGULAR.—The cans in this are removed to bench for skimming automatically.

THE JUNIOR.—In this the skimming is done automatically without removing cans from Creamer.

THE UPRIGHT or CABINET.—Has a compartment under the water tank, the illuminated conical point of can projecting into lower compartment; skimming without removing cans.

THE ELEVATOR.—Has a hoisting arrangement for raising cans out of the tank. Skims automatically, before removing cans from platform of the elevator.

It requires no milk room.
It raises all of cream between milkings.
It requires less labor. It affords better ventilation and is cheaper.
Over 10,000 in Use.

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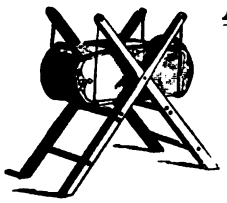

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Corn and Oats, - - - - - - -	60 " " "

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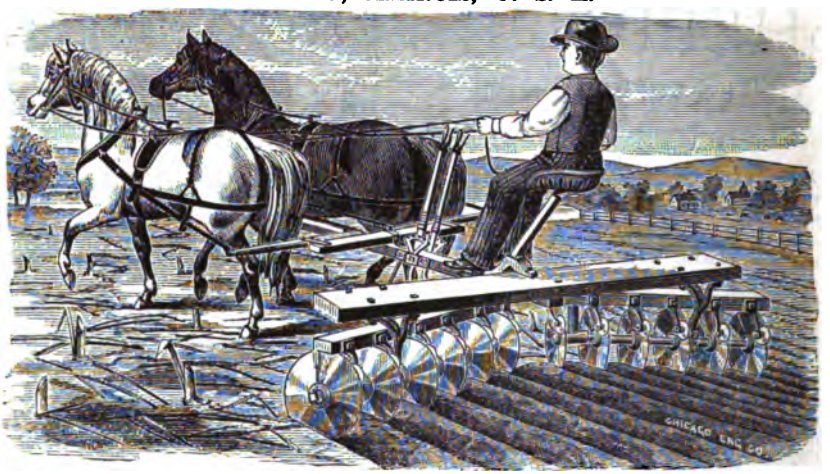

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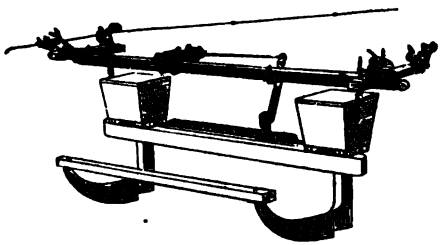

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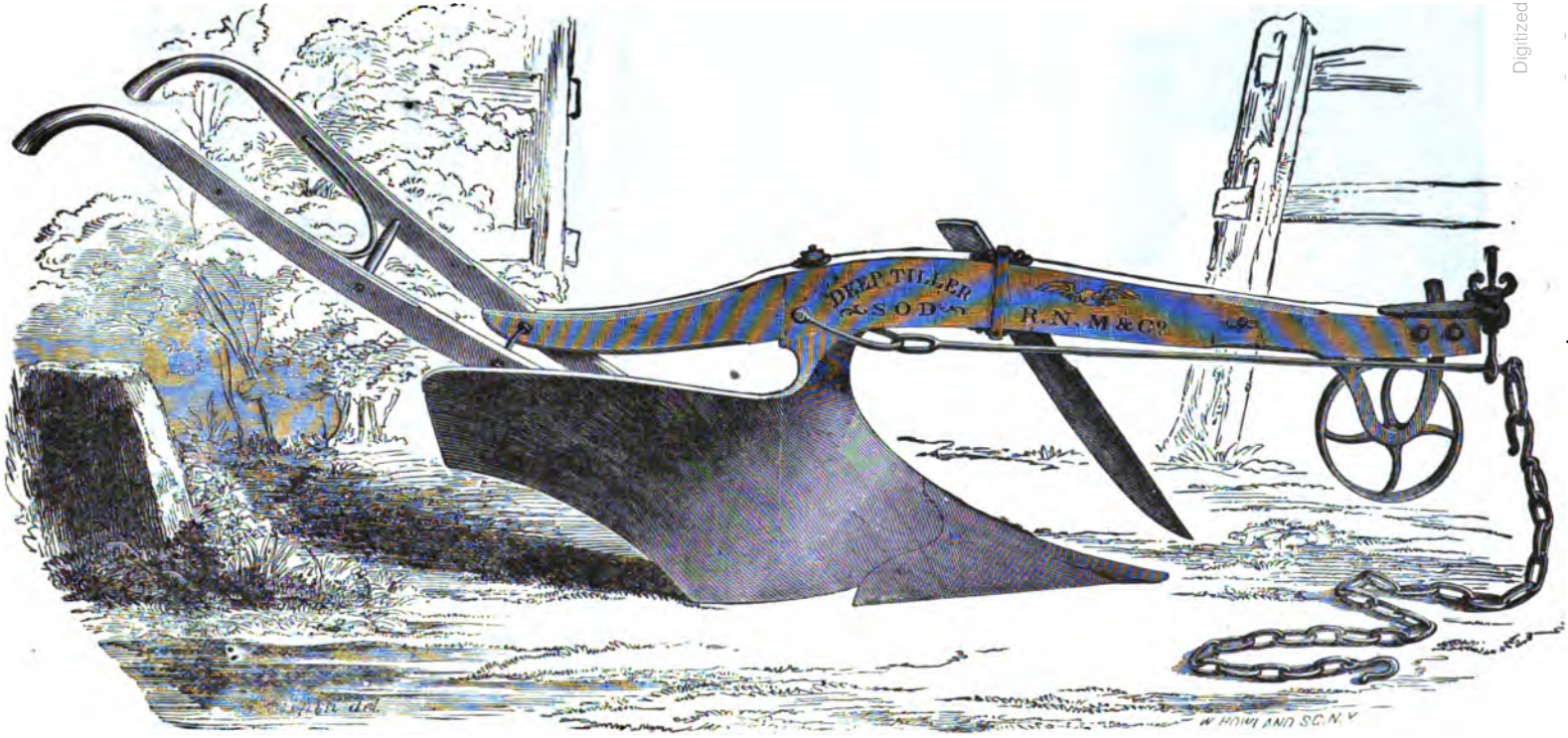

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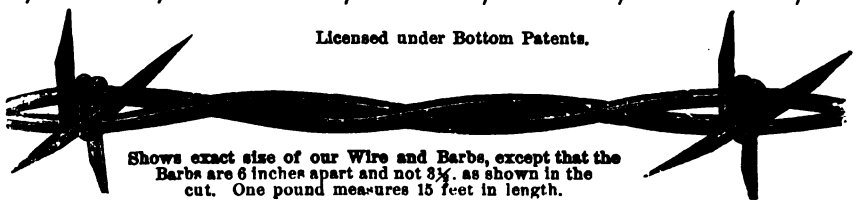

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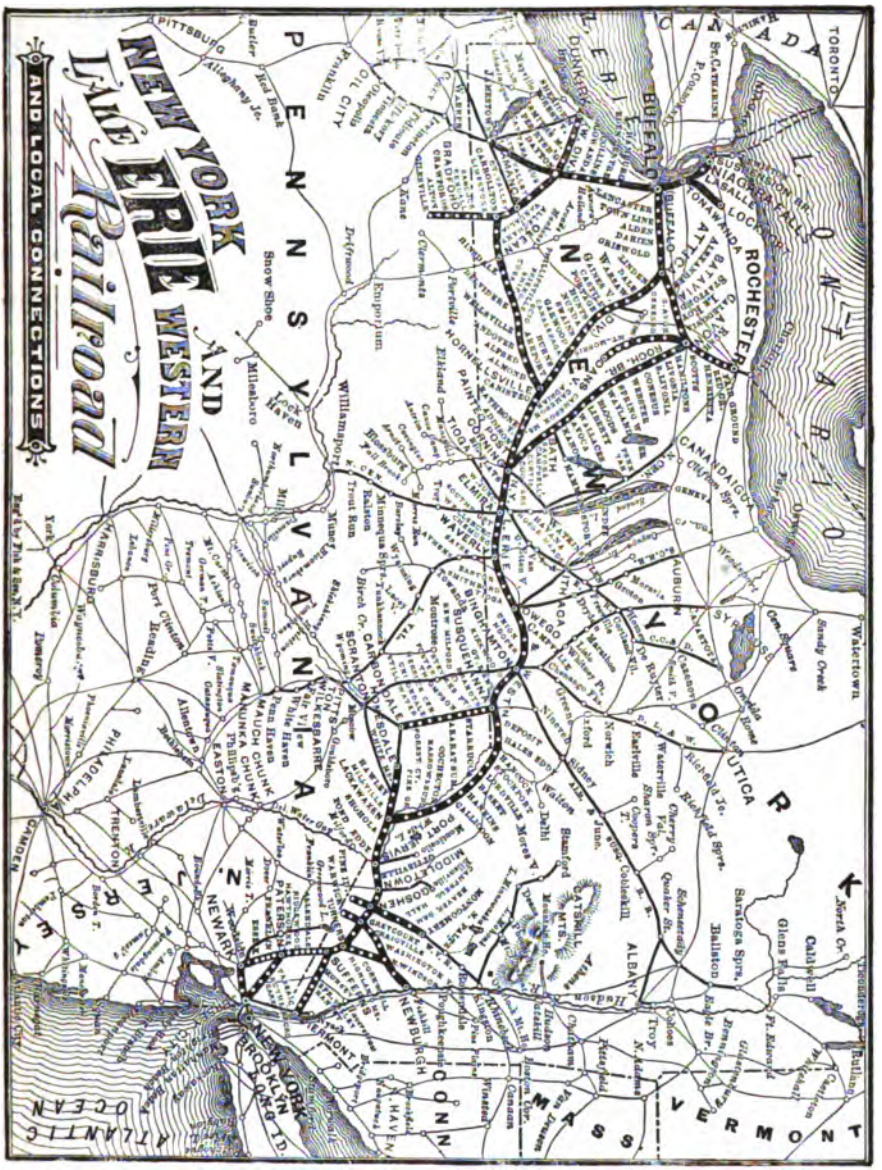

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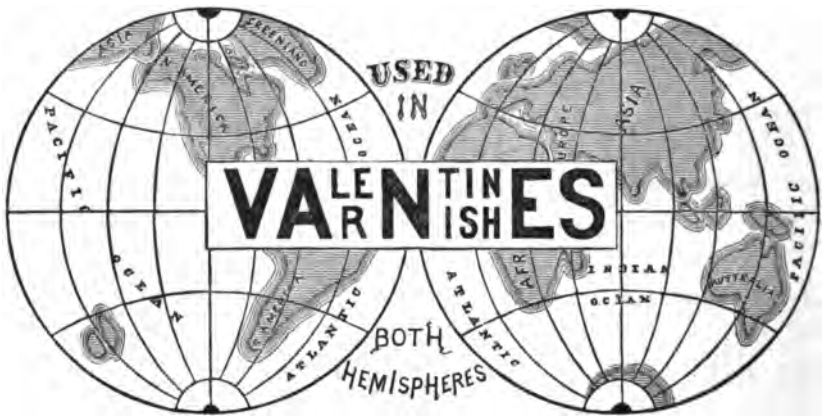

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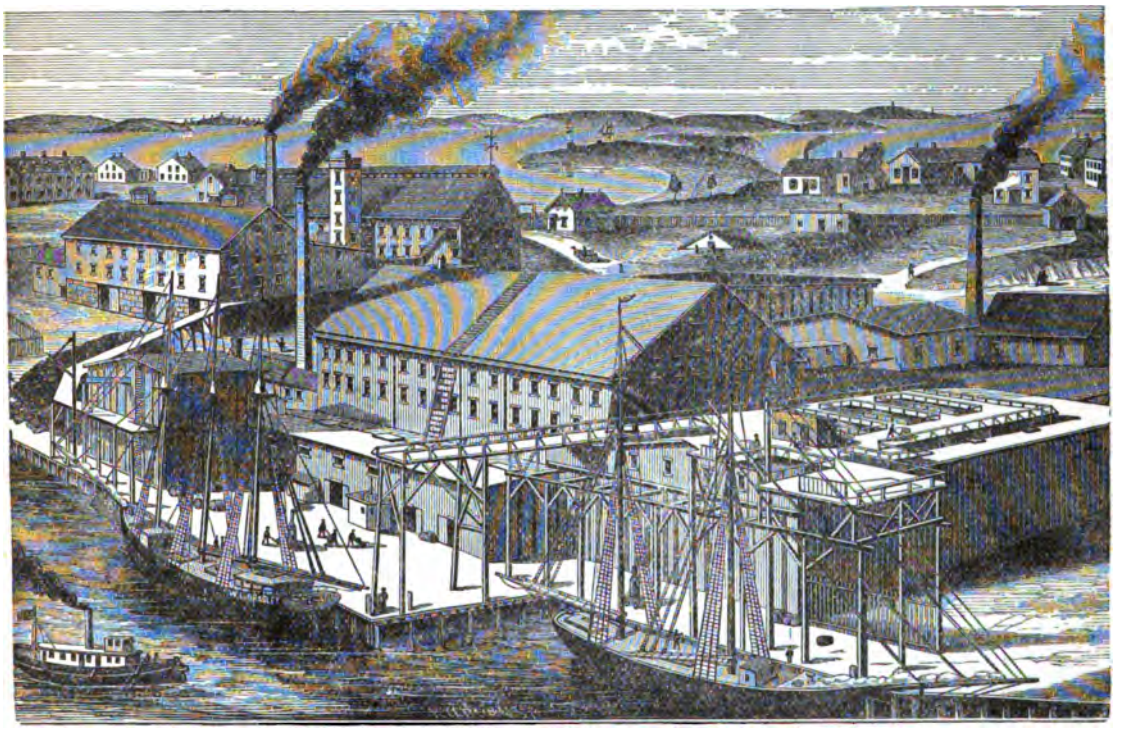

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